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Get-together on Weights and Balances

A two-day get-together on Weights and Balances, jointly sponored by the National Physical Laboratory (NPL), New Delhi, the Directorate of Weights and Measures (Ministry of Commerce) and the Indian Standards Institution, was held at NPL on 19 and 20 Dec. 1968. This was a sequel to the get-together on thermometry held in Feb. 1967, which had an encouraging response from the industry. It was as a result of this get-together that an association of thermometer manufacturers was formed.

Inaugurating the conference at the instance of Dr A. R. Verma, Director, NPL, who formally welcomed the delegates, Dr Atma Ram, Director General, Scientific & Industrial Research, observed that it was only conferences of this type hat provide a forum to the repreentatives of industry and research cientists to discuss problems of mutual interest. Proper identificaion of problems of industry, Dr Atma Ram pointed out, could be onsidered as partial solution of the roblems. Stressing the importance f precision in scientific knowledge n general, the Director General said hat sensitivity and precision are f utmost importance to the weights nd balances industry. It is in elping the weights and balances ndustry that the Weights and Meaures Division of NPL had a vital ole to play.

Proposing a vote of thanks, Dr K. N. Mathur, Emeritus Scientist, PL who was the first Head of the Weights and Measures Division, bserved that this Division is the ackbone of the Laboratory. The PL was patterned on the National hysical Laboratory, Teddington, .K. Emphasizing the importance of ccuracy of weights and balances in ientific work, Dr Mathur said that the discovery of rare gases by Sir William Ramsay would not have been possible but for the high precision and accuracy of the balance. Dr Mathur said that in 1947 when NPL was in the planning stage there was only a small balance industry which had no agency to assist it in producing accurate weights. But today, thanks to the role of NPL, there is a flourishing balance industry in the country.

Shri Prem Prakash, Head of the Weights and Measures Division, who read a background paper on the topic stated that the main purpose of the get-together was to establish contacts with the small and medium scale manufacturers of weights and balances with a view to creating an awareness for accuracy in weights and balances, the large scale manufacturers being already in close contact with NPL. Stressing the importance of making precise weighments and measurements, he stated that newer techniques are being developed in the maintenance of standards and their realization in actual practice. He referred to some of the outstanding discoveries in this field, such as the re-defining of the metre in terms of the wavelength of krypton (^{86}Kr) radiation and of the second in terms of the atomic frequencies. Concluding, Shri Prem Prakash gave a brief account of the assistance rendered by NPL to the weights and balances industry as also in the implementation of the metric system in the country and formulation of standard specifications (*see* pages 3-6).

Dr Ing. Walter Muhe of the Physikalisch Technische Bundesanstalt (PTB), Braunschweig, West Germany gave an account of the activities of PTB with special reference to its relation with legal metrology. Mr G. N. Sharonov, Head of the Division, Committee for Standards, Measures and Measuring Instruments, USSR spoke of

Weights and Balances Get-together, NPL, New Delhi at the inaugural session on 19 Dec. 1968 (from left): Shri Prem Prakash, Dr K. N. Mathur, Dr Ing. Walter Muhe, Dr Atma Ram and Dr A. R. Verma the structure of metrological service in Russia.

In the technical sessions which followed, about a hundred delegates from all over the country as well as the German and Russian delegates participated. Seven papers on the following topics were read and discussed: (1) Commercial and non-commercial weights and measures, (2) Household and scientific scales, (3) Problems of weighing machinery in India, (4) Performance requirements of a single pan two knife edge balance, (5) Analytical weights, (6) Class A weighing at the Board of Trade, London, and (7) Evolution of standard of mass.

Delegates from industry put forward nearly seventy items for discussion. Most of these had a bearing either on the enforcement laws or the verification procedures adopted in various States. Discussion centred round the question of keeping some items such as equipment used in laboratories, in factories for non-trade purposes, and for household purposes beyond the purview of the Weights and Measures Laws. A plea was made by the manufacturers for the establishment of branch laboratories of NPL at all important centres, for the testing of precision balances and weights, in view of the risks involved in the transportation of such delicate items.

Ready-to-serve Mutton Sausages

A basic composition for making ready-to-serve mutton sausages has been standardized by the Central Food Technological Research Institute, Mysore. The mutton sausages are nutritionally well blended, delicious and balanced. They are seasoned with popular spices and flavoured with select condiments to satisfy discriminating tastes. Packed in casings, they keep well longer than fresh meat—i.e. about a week—at a temperature of 4-5°C. They are also fortified with vitamins and minerals.

The mutton sausages are precooked and need only very little further cooking. The preparation needs only roasting on a flat frying pan or kitchen skillet smeared thinly with any edible cooking fat for 10-12 min. at medium heat to the desired browning. In order to get uniform browning they are to be turned and rolled during frying.

Use of Indigenous Materials in Coal Petrography

In the preparation of coal specimens, for microscopic examination, imported materials are presently used, viz. transparent lucite (polymethyl methacrylate) moulding powder for specimen mounting, AB jeweller's rouge powder (3μ) for initial polishing, silvo-earth for semi-final polishing and gamma-alumina for final polishing. Investigations have been carried out at the Central Fuel Research Institute, Dhanbad on the qualifying physical and chemical properties of these materials with a view to substituting these by indigenously available materials at different stages of coal petrographic work. The indigenous compounds, Indian shellac, green chromium oxide powder, agated Indian coal ash (high silica plus alumina content), and light hydrated alumina have been found suitable. The use of polystyrene for specimen mounting and of light calcined magnesium oxide for final polishing has also been studied. These are, however, imported but may be more readily available as replacements.

Processing of the materials for the purpose has been standardized. Comparative performance tests have shown that the indigenous materials compare well with the imported ones.

Physico-mechanical Properties of Refractories

This investigation carried out by Shri T. V. Prasad of the National Metallurgical Laboratory, Jamshedpur under the guidance of Dr B. R. Nijhawan led to the award of Ph.D. degree (1968) of the Banaras Hindu University.

The aim of the investigation was to correlate the technological factors involved in the production of basic refractories with their physico-mechanical properties with a view to improving the quality of refractory bricks. The technological factors considered in the investigations are: (i) composition, (ii) firing temperature, and (iii) forming pressure. Emphasis was, however, laid on the effect of the first two factors on the microstructure of magnesite and chrome-magnesite refractories and its relationship with their physical properties and high temperature torsional behaviour. Four naturally occurring magnesites, the chemical analyses of which were typical of those used in the industry, and a chrome ore, specially processed to give different fractions with varying silica content were used for the study. The CaO/SiO_2 ratio (by wt) of magnesite compositions varied between 0·21 and 1·6. The silica content of the chrome-magnesite compositions varied between 3 and 6 per cent.

The effect of bond structure of basic refractories on the thermal shock resistance and the effect of iron oxide expansion on the bursting of chrome-magnesite refractories have been studied. The effect of forming pressure on the physical properties and high temperature load bearing characteristics has also been studied on magnesite, chrome-magnesite and magnesite-chrome bricks prepared under industrial conditions.

The changes in the constitution and microstructure of test specimens fired between 1500° and 1700°C have been examined by X-ray powder diffraction and microscopical methods. The progress of reactions between magnesia and chrome spinel in chrome-magnesite test specimens fired to different temperatures was studied by determining the lattic parameter of the spinel solid solution from the X-ray data.

The following are the main conclusions of the study. (1) The improvement in the properties of chrome-magnesite refractories brought about by high temperature firing is limited by the silica content of the brick; when the silica content exceeds 5 per cent, high temperature firing is detrimental to the development of direct bond between chrome spinel and periclase on one hand and between periclase and periclase on the other, thus resulting in poor resistance to creep in torsion at 1300°C. (2) Though extensive development of direct bond in chrome-magnesite refractories is beneficial to the resistance of these bricks to iron oxide bursting, it impairs their thermal shock resistance. (3) Considerable improvement in the physical properties of basic refractories and their resistance to creep under compressional load at high temperature in particular can be effected by employing forming pressures exceeding 800 kg/cm^2.

MAINTENANCE AND STANDARDIZATION OF WEIGHTS AND MEASURES

Significant Contributions of NPL

The Weights and Measures Division of the National Physical Laboratory has in its purview: (i) maintenance of related standards, (ii) supplying authenticated copies of these, (iii) carrying out testing for industry, (iv) calibrating various types of measuring instruments, gauges, apparatus and appliances, (v) developing new instruments and measuring techniques, and (vi) providing technical assistance in the formulation of standard specifications.

Maintenance and Supply of Standards

The Division maintains the national standards of length and mass, i.e. the platinum-iridium metre bar and the kilogramme and other related derived standards. It supplies authenticated copies of different grades of these standards, in various denominations, to all those requiring them throughout the country. It possesses a well-equipped metrology laboratory and carries out examination and certification of all such items as require measurements of length, angle, surface flatness, surface finish etc. as well as the calibration of the mass of weights ranging from fraction of a milligramme to 50 kilogrammes, volumetric glassware, hydrometers, pressure gauges, stop-watches, taximeters, etc.

A primary standard barometer based on the NPL, Teddington pattern has been constructed and is now being set up. The construction of a high precision 1 kg balance has now been taken up.

Calibration for Research & Industry and Developmental Testing

While drawing up the yearly programme of work of the Division the actual requirements of industry and of various other organizations interested in standards and calibration work have always been given due weightage. From the very beginning this Division has maintained close contact with industry and has been carrying out extensive testing with particular stress on developmental testing. Whenever necessary, technical advice is given to manufacturers of various items thereby enabling them to improve the quality of their products. This has helped in cutting down imports and thereby effecting saving of foreign exchange. Apart from testing for industry, a large number of items of volumetric glassware, precision weights and other instruments required for research purposes have also been calibrated. About 10,400 test certificates have been issued during the past eighteen years.

Assistance rendered to the balance industry deserves special mention. Technical advice given to balance manufacturers during 1954-55 enabled many of them to produce good quality balances and weights suitable for scientific purposes. When the "Weights and Measures Act of 1956" came into force, this work acquired more importance and intensive work on the developmental testing of balances was again taken up. Within a short time, balances suitable for the work of Enforcement Departments for verifying commercial grade weights were produced. A few hundred sets of these were produced by several manufacturers. The third phase of this work started about a couple of years ago when assistance was provided in the production of balances of still higher accuracy, meant for the periodical verification of working standard weights belonging to these departments. The success achieved in the development of these balances was encouraging. Production of such balances has now been taken up by two manufacturers and nearly two hundred balances have already been produced. With the production of about 3,500 balances over the past few years a saving of more than a crore of rupees in foreign exchange has been effected and it is expected that within the next two years the production of high precision balances will result in the saving of another half a crore of rupees. The next phase of this work will be taken up during the next year when assistance will be provided for the manufacture of balances of highest precision required by the Enforcement Departments for the verification of their secondary standards against the reference standards.

Developmental Projects

Considerable work on the production of very fine scales, such as special graticules, etc. has already been done. Work has also been undertaken on the production of accurate surfaces, gauges and balance knife-edges. A large number of test equipment has been designed and constructed from time to time for day-to-day test work.

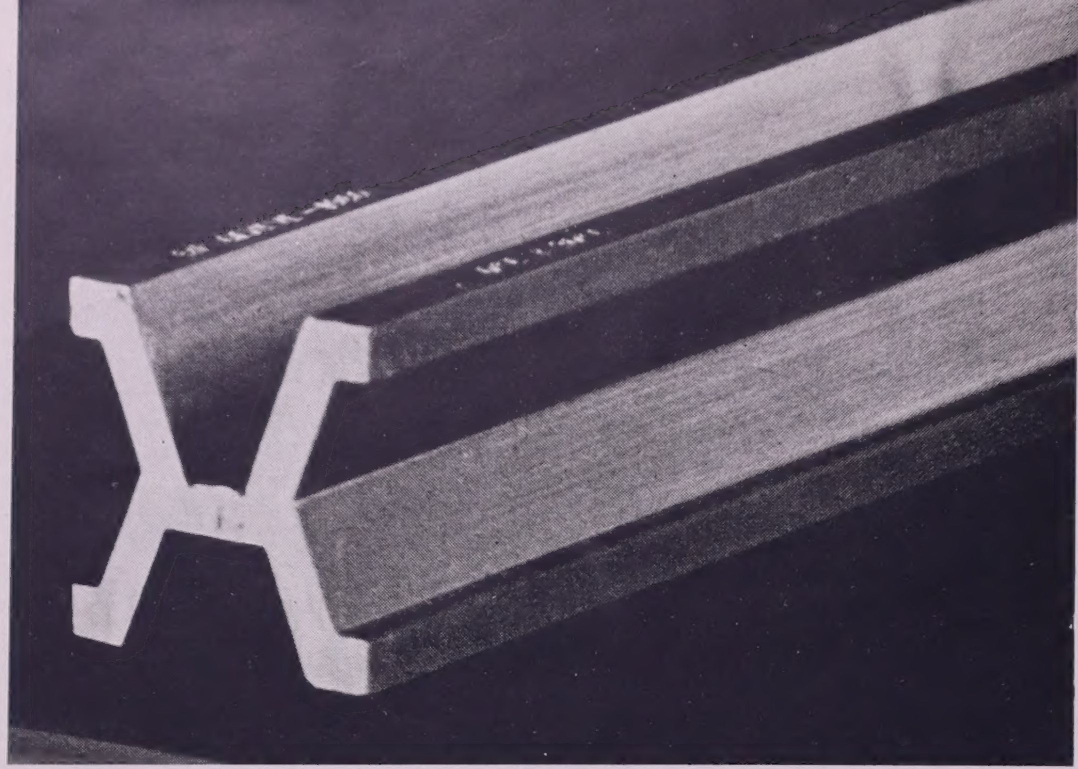
Implementation of Metric System

The Division has been associated with the implementation of metric system in the country right from the drafting stage of the "Weights and Measures Act of 1956" and has played a major role in its successful implementation. The following tasks were successfully carried out:

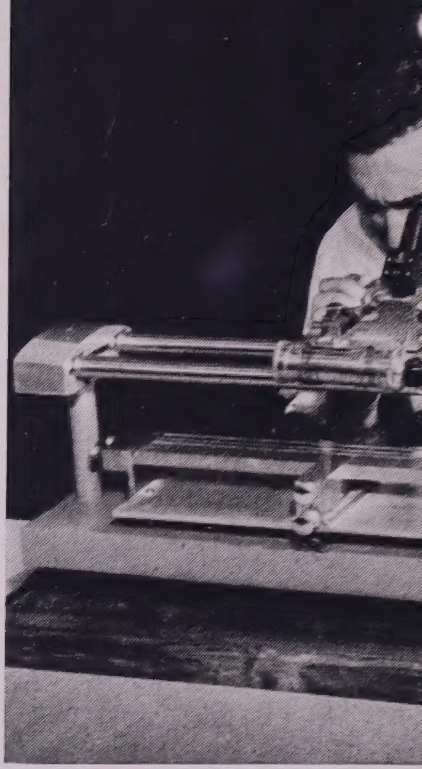
(i) Preparation of suitable designs for reference, secondary and working grades of standard weights and measures as well as various grades of commercial weights and measures. The specifications of the latter have been published as Indian Standards.

(ii) Working out coherent series of permissible errors applicable to the entire range of weights and measures starting from the reference grade down to the lowest commercial category.

(iii) Making some twenty demonstration sets of complete series of commercial grade weights and measures, one for each State and Union Territory. This was done before the Act came into force and it proved

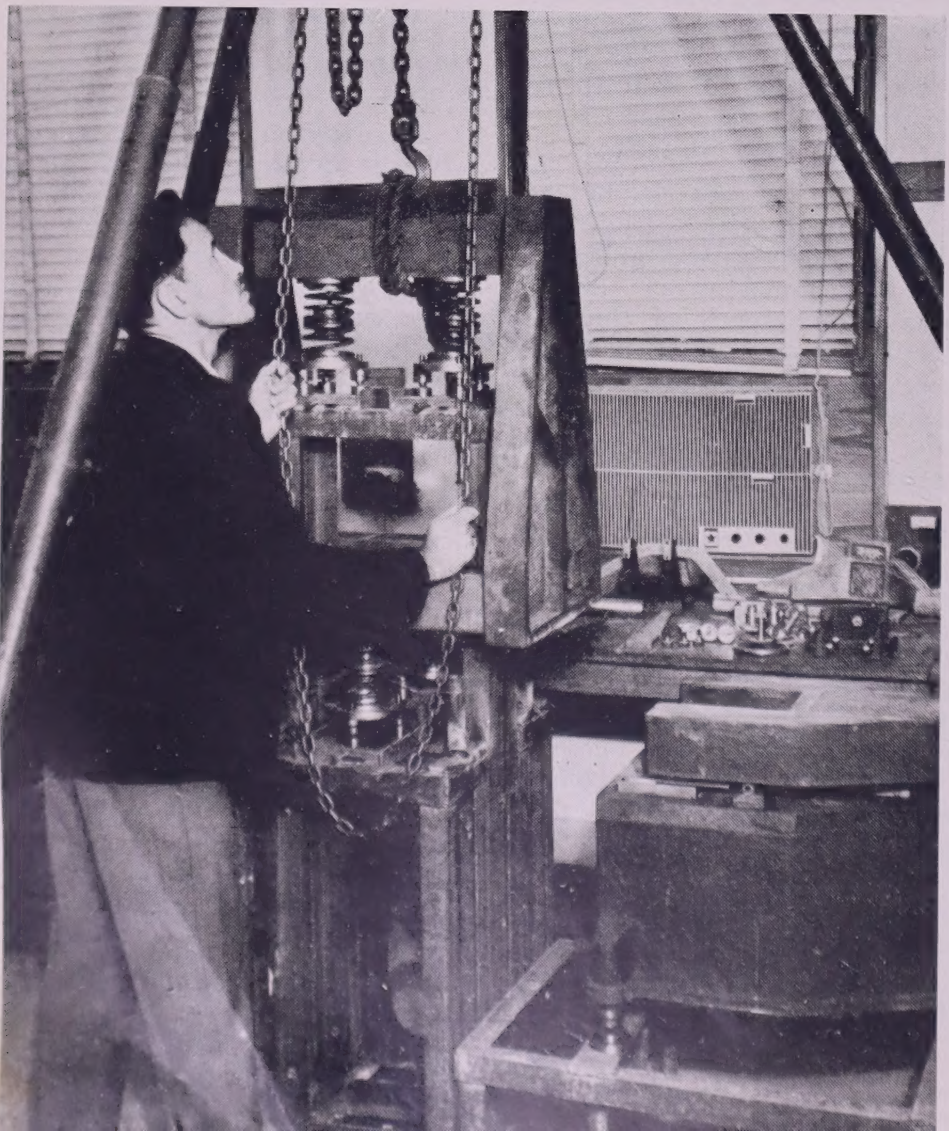


National Prototype of the Metre (end view): This platinum-iridium metre bar (Sr. No. 4) calibrated by the International Bureau of Weights and Measures, Sevres, France, is the ultimate standard of length in the country. All other standards in the country, including the reference standards used in NPL, are calibrated in terms of this prototype



Metre Comparator: This instru
Enforcement Departments is bein

Primary Standard Barometer: All the parts of this instrument have been constructed at NPL and the barometer is under installation



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India Government Mint, Bombay

balances which are to be
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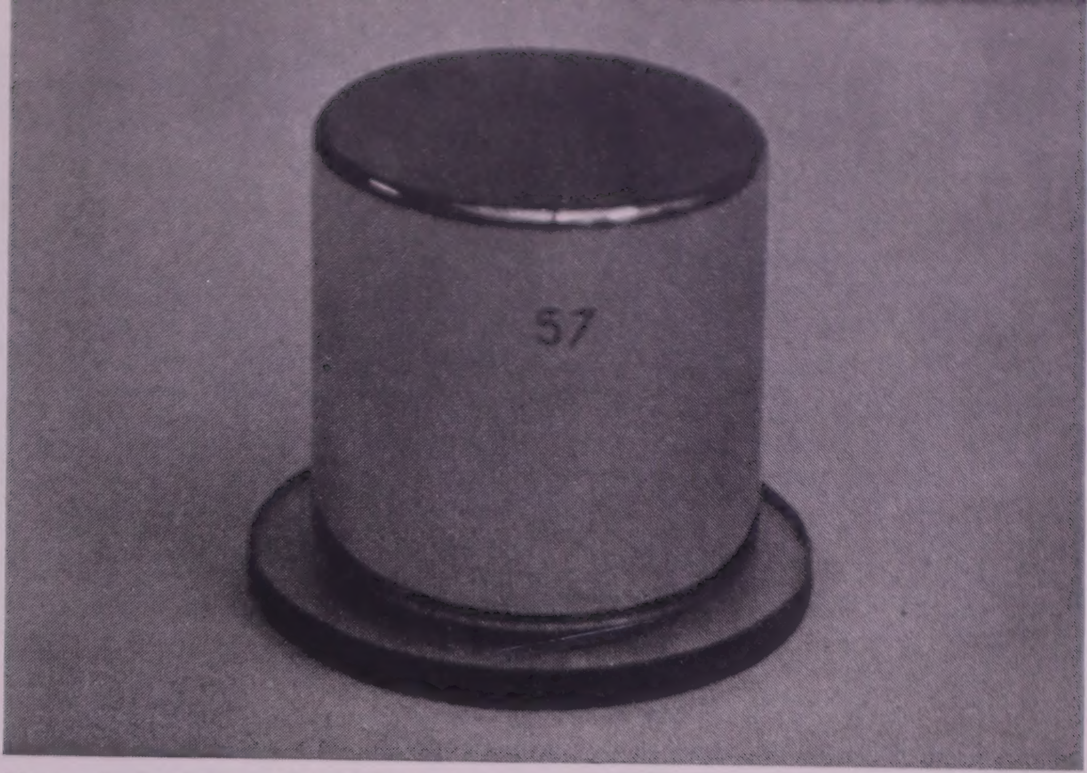
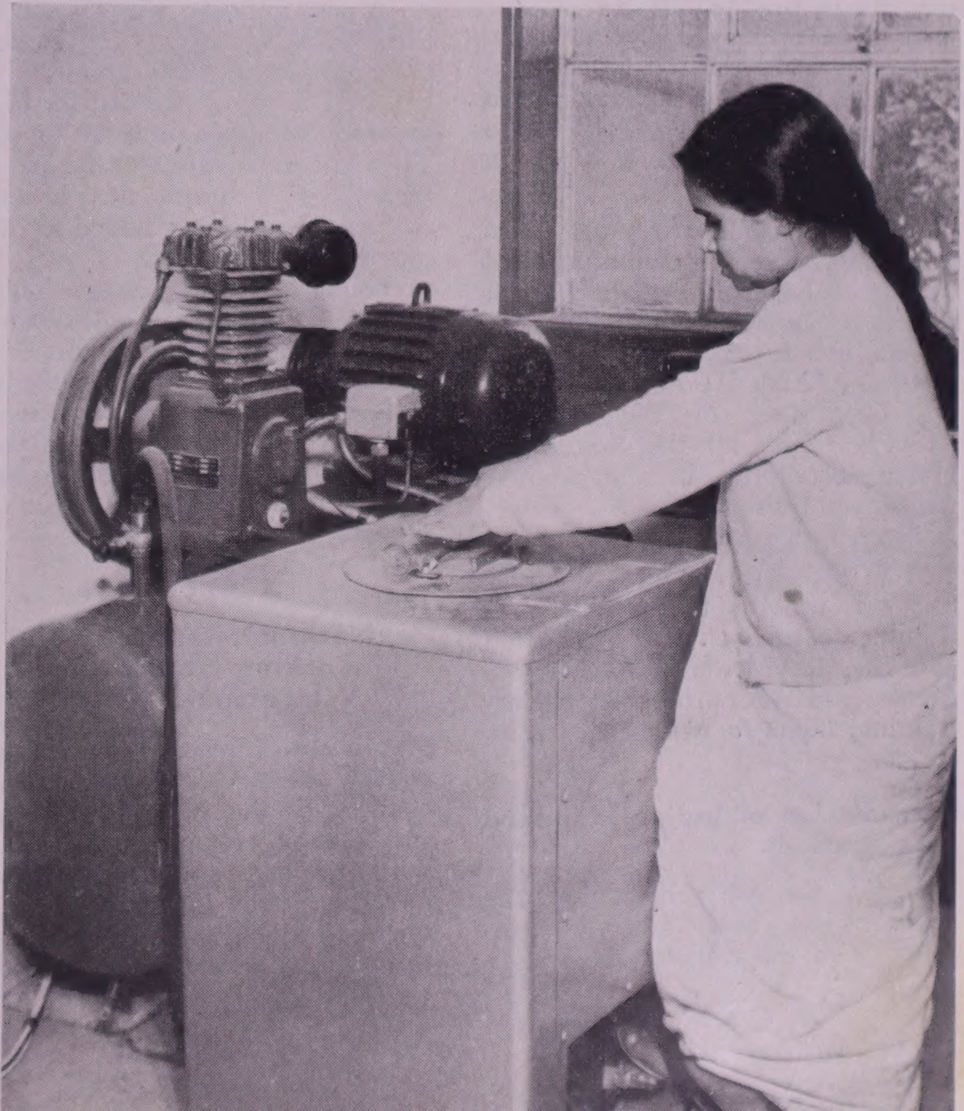


National Prototype of the Kilogramme: This platinum-iridium kilogramme weight (Sr. No. 57), calibrated by the International Bureau of Weights and Measures, Sevres, France, is the ultimate standard of mass in the country. All other standards in the country, including the reference standard used in NPL, are calibrated in terms of this prototype

A Simple Sand Jet Marking Machine: Designed for the use of the Weights and Measures Enforcement Departments this machine is used for marking glassware, after verification



very effective in familiarizing the authorities and the public with the new system of weights and measures. A large number of manufacturers of commercial weights and measures were given necessary know-how and instructions for the proper manufacture of these items.

(iv) Calibrating and supplying 400 sets of standards of mass and capacity measures and length measures for the Enforcement Departments all over the country.

(v) Rendering necessary technical assistance to Central as well as State Weights and Measures Departments, such as compiling of special calibration tables for bronze standards, capacity measures and advising on setting up of precision laboratories, procurement of equipment, training of staff and various technical problems arising from time to time in the enforcement work.

(vi) Developmental projects have also been undertaken in connection with the implementation work. A metre comparator and a glass marking machine have been designed. The metre comparator is being manufactured by the India Government Mint and the glass marking machine by private industry. These have been responsible for saving a very large amount of foreign exchange. The total savings, when the project is completed, will be to the tune of half a crore of rupees in foreign exchange.

(vii) Imparting advanced training in high precision calibration and testing of balances, weights, linear measures, capacity measures, taximeters, etc. including some general physics. About 500 officers, including Controllers of Weights and Measures from all the States and Union Territories in the country were given training.

(viii) The Division is represented on half a dozen technical committees set up by the Ministry of Commerce, such as those connected with the Revision of Weights and Measures Laws, prototype testing, training, laying down specifications, etc.

Formulation of Indian Standard Specifications

From the very beginning the Division has been actively associated with the work of the Indian Standards Institution. On account of the diverse activities of the Division, it represents the NPL (CSIR) on a large number of Technical Committees, Sub-Committees and Panels of ISI connected with engineering metrology, machine tools, ball bearings, screw threads, optical and mathematical instruments, commercial weights and measures, test sieves, water meters, graduated laboratory glassware, dairy laboratory apparatus, medical instruments and apparatus and meteorological instruments, etc. as well as on the General Council and the Engineering Division Council and its SWC(E). It has collaborated in the preparation of nearly 500 national standards.

Training Facilities

Technical training is being regularly given to representatives of industry, particularly the manufacturers of weights, balances, volumetric glass, gauges, measuring instruments, etc. Training in engineering metrology was also imparted to a large number of students of engineering.

Future Programme

A new building with special facilities such as vibration-free floors, close temperature and humidity control, etc. is being planned for higher precision standards and testing work. This will also house the 50 m. tape measuring equipment. Draught-free rooms will be provided for housing as well as testing of very high precision balances. Work on the approval of prototypes will be shortly taken up. This will involve considerable expansion of present facilities. It is hoped that after carrying out the proposed expansion the laboratory will be able to render much greater assistance to science and industry in the country.

National, Reference and Working Standards of Weights and Measures

National Prototypes of the Kilogramme and the Metre: Each member country of the Metric Convention gets a copy of each of the international prototypes which are certified in terms of the international prototypes. India possesses copy No. 57 of the international prototype of the kilogramme and copy No. 4 of the metre. These are deposited at the National Physical Laboratory.

NPL Standards: These standards are used by the NPL for calibrating the reference standard weights and measures of the States and are themselves calibrated in terms of the national prototypes.

Reference Standard Weights and Measures: Under the Standards of Weights and Measures Act, 1956, each State and Union Territory receives a set of standard weights and measures which are called reference standard weights and measures. These have to be calibrated periodically by the NPL.

Secondary Standard Weights and Measures: These are standards of weights and measures which are calibrated periodically against the reference standard weights and measures in the State. The State Governments keep secondary standards in each region.

Working Standard Weights and Measures: These standards are used by the Inspectors of Weights and Measures for verifying the weights and measures used in trade and industry. These are periodically calibrated against the secondary standard weights and measures.

Weights and Measures used by the Public: These are the weights and measures which are verified periodically by the Inspectors of Weights and Measures against their working standards and stamped if they are found to be within the permissible errors laid down for the purpose. These verified weights and measures are then used in trade or industry.

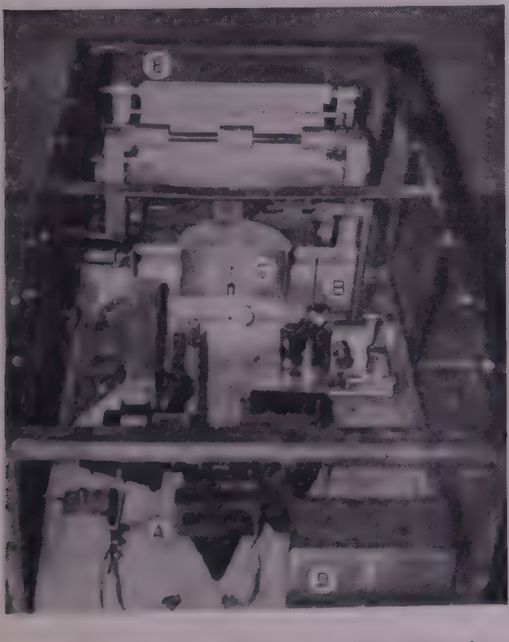
List of ISI Specifications on Weights and Balances Prepared by NPL

1. IS : 1056-1965 Indian Standard Specification for Commercial Metric Weights (Revised)
2. IS : 1057-1968 Indian Standard Specification for Commercial Metric Carat Weights (First Revision)
3. IS : 1433-1965 Indian Standard Specification for Beam Scales (Revised)
4. IS : 4532-1968 Indian Standard Specification for Portable Scale for Jewellers

SRTEE Develops Accelerograph and Tiltmeter

An accelerograph for measuring strong ground motion during earthquake has been designed and developed by the School of Research and Training in Earthquake Engineering (SRTEE), Roorkee using only indigenous materials. The instrument records the ground acceleration from three torsion pendulums. A mirror fixed on the torsion pendulum on a photographic paper and mounted on a motor driven revolving drum records the vibrations of the light ray reflection. A time mark is imposed at 0.5 sec. intervals with the help of a clock on this photographic paper which is run at a speed of 20 mm/sec. A special feature of the accelerograph is the built-in starting device which operates the lights and motor for recording the earthquake. The true ground acceleration recorded as a function of time by the accelerograph is employed in determining the response of the structure and the acceleration response spectrum curves for the earthquake resistant design of structures. Such accelerographs are being fabricated by SRTEE and will be installed in the Ganga and Yamuna river valley projects in U.P. and the Koyna Project in Maharashtra.

Portable water tube tiltmeters for measuring the secular ground tilt associated with the gradual elastic strain accumulation in active seismic areas are not manufactured in the country; the fabrication of the instrument involves foreign exchange. Utilizing only the indigenous resources, the School has designed and developed a portable water tube tiltmeter. The equipment consists of two identical cylindrical metallic vessels connected by an alkathene tubing. At the mid-height of each vessel there is a built-in partition. A precision micrometer spindle is attached to the lower side of the partition; the upper end of the spindle intrudes the upper half of the vessel through a waterproof cell and can be moved up and down. The system is filled with water to provide a common reference. The height of water level above the tilt base can be measured with an accuracy of 10μ. The setting is aided by a microscope. The difference in the two readings gives the relative elevation of the two bases; the tilt of the ground can be measured by repeated observations. Programmes for measurement of ground tilt with this system have been started at the Yamuna Hydel Scheme project site, Dehra Dun and Pophali Power Scheme house in the Koyna Project area.



Accelerograph designed and fabricated at SRTEE [A, accelerometers; B, starter; C, light source; D, clock; E, photographic recording unit]

Sponsored Research

New Scheme

Helminth Parasites of Fresh-water Fish

To date attention has been paid to morphology and taxonomy of helminth parasites, but information on helminthiasis in fish is scanty. The study of pathogenic effects of helminth parasites thus gains importance in the context of pisciculture as a food source. Uttar Pradesh has an extensive and promising fishery. However, a majority of fish carry helminth infection resulting in deterioration in fish food value, and in some cases in fish mortality. This new sponsored scheme is being taken up by Prof. S. P. Gupta and co-workers in the Department of Zoology, Lucknow University, Lucknow.

Infested fish (at larval stage) can be a potent source of helminth infection to man. Helminth parasites harm their host (fish) in many ways: (i) by causing mechanical injury such as irritation, injury or atrophy of tissues and occlusions of blood vessels, alimentary canal and other ducts; (ii) by introducing toxic metabolic byproducts able to produce changes in the blood, enzyme, vitamin or hormone activity of the host; (iii) by depriving the host of food; and (iv) by acting as carriers or vectors of other pathogens.

Portable water tube tiltmeter designed and fabricated at SRTEE

The investigation includes: (1) Study of a large number of fresh-water fish with a view to examining the parasite-host relationship, and studying the incidence and intensity of infection in larval and adult stages; (2) Study of life-history of the helminth parasites infecting fish including a study of the bionomics of the intermediate host; and (3) Control measures including elimination of intermediate host and other biological methods of control.

Visitors

Dr J. A. Shallen-Burger, Distinguished Professor, Development of Grain Science & Industry, Kansas State University, USA visited the Central Food Technological Research Institute (CFTRI), Mysore on 26 Nov. 1968 and gave a talk on 'The future of cereal technology research'. Another visitor to CFTRI was Dr N. Blakebrough, University of Birmingham, UK (presently Professor of Biochemical Engineering, Indian Institute of Technology, New Delhi) (29 Nov. 1968). He gave a talk on 'A chemical engineering approach to problems of food processing'.

Machinery and Equipment Developed by CMERI

The Central Mechanical Engineering Research Institute (CMERI), Durgapur has brought out an 88-page publication (demy 8vo) under the above title. The publication describes briefly some of the important instruments, machinery and equipment developed or in advanced stage of development. The products range from small electronic instruments like an electronic comparator to measure 1/25000 of an inch variation in dimension to large and robust machinery like the 100 ft long cable stranding machine. Wherever the product has been developed in collaboration with industry, mention is made of the collaborator.

The products covered include: machinery for specific industries such as cable making industry and road making industry; agricultural equipment like tractors, implements and insecticide sprayer; machine tools like pneumatic hammers; conveying equipment like escalators; transport equipment like scooter and moped; quality control instruments such as hydraulic dynamometer, pneumatic gauges, portable hardness testers and electronic comparator; special material and product evaluation equipment like creep testing machine and spring fatigue testing machine; etc.

The development of special purpose machinery for mass production involves many speed controls and automatic process controls. Such controls have also been developed using as far as possible indigenous components. The controllers for plastic extrudes like preheaters, eddy current coupling, electromagnetic clutch, automatic length measuring equipment, tension controls, diameter controls are some of the developments in the field.

Many of the products listed are in production. A statement showing the stage of progress and unit cost of each such product is given.

While many of the products have been developed in collaboration with industry for eventual production by them, some products are available for commercial exploitation. Those interested in taking up the manufacture of such products may correspond with the Institute. Copies of the publication would be made available to prospective entrepreneurs.

PATENTS

FILED

116837: *Iodine tablets*, B. N. Pathak, K. R. Bulusu & S. B. Dabadghao — CPHERI, Nagpur.

116841: *A process for the synthesis of a plasticizer for polyvinyl chloride resins*, R. K. Bhatnagar & A. K. Jain—SRIFIR, Delhi.

116928: *Scaffold hoist (powered)*, B. C. Srivastava & R. L. Gupta—CBRI, Roorkee.

116953: *Coagulant aid-4*, V. P. Thergaonkar, K. R. Bulusu, D. N. Kulkarni & B. N. Pathak—CPHERI, Nagpur.

116996: *Coagulant aid-5*, B. N. Pathak, K. R. Bulusu, V. P. Thergoankar & D. N. Kulkarni—CPHERI, Nagpur.

117025: *Coagulant aid-7*, K. R. Bulusu, V. P. Thergaonkar, B. N. Pathak & D. N. Kulkarni—CPHERI, Nagpur.

ACCEPTED

106906: *An improved method for removal of iron from ferruginous chrome and manganese ores*, R. N. Misra, P. V. Viswanathan & P. P. Bhatnagar—NML, Jamshedpur.

107861: *Nonlinear discs for use in lightning arrester/surge diverters*, M.A.V. Devanathan, V. Rengachari, R. Radhakrishnan, K. S. G. Doss & J. P. Nityanandan—CECRI, Karaikudi.

107982: *Stable castable suspensions of non-plastic, aluminosilicate materials and methods of making the same*, A. V. Subrahmanyam & H. P. S. Murthy—NML, Jamshedpur.

108081: *Refractory ramming, plastering and patching mixes*, M. C. Kundra & H. P. Srinivasa Murthy—NML, Jamshedpur.

108208: *In and for a tractor mounted reciprocating mower, a combined break-back-cum-lifting arrangement*, Chandra Mohan & Balbir Singh Devgun—CMERI, Durgapur.

108343: *Process for the preparation of potassium carbonate using ion-exchange techniques*, D. R. Baxi—CSMCRI, Bhavnagar.

SEALED

98151: *Improved latch arrangement*, S. N. Bhagi—CMERI, Durgapur.

100489: *Friction prop*, B. Singh & N. S. Saxena—CMRS, Dhanbad.

100675: *An integrated process (oleo flotation) for upgrading and dewatering of small coal*, A. K. Chakravarti, J. Chattopadhyay, G. G. Sarkar & A. Lahiri—CFRI, Jealgora.

101161: *Process for the preparation of day-light and pink-light emitting electroluminescent phosphors*, D. S. Ambardekar & A. B. Biswas—NCL, Poona.

102485: *Improvements in or relating to the electrochemical production of succinic acid from either maleic acid or fumaric acid*, H. V. K. Udupa, M. S. V. Pathy & R. Kanakam—CECRI, Karaikudi.

ADVERTISEMENT NO. 32/68

Applications are invited for the post of Director, Central Institute of Scientific Information & Publication (CISIP), New Delhi under the Council of Scientific & Industrial Research.

The Central Institute of Scientific Information & Publication is a national organization in the scientific information field and incorporates the Indian National Scientific Documentation Centre (Insdoc) and Publications & Information Directorate. CISIP is responsible for the collection, processing and dissemination of scientific and technical information. Its functions include documentation, translation and reprography services, publication of scientific journals, the Wealth of India series, monographs, bibliographies, abstracts, reviews, reference works, etc. In general, it provides information backing for scientific research and industrial matters.

Scale of pay: Rs 2000–100–2500.

Qualifications: Applicants must have good qualifications in a branch of science, including library science, technology or engineering; and extensive experience in one or more of the activities mentioned above. Established record of organizational and management abilities and qualities of leadership are essential.

Job requirements: To head the Central Institute of Scientific Information & Publication and to plan and guide all its activities and programmes.

There is no standard form of application. Those who wish to be considered are invited to send a statement of their qualifications and attainments with the following information to the Secretary, Council of Scientific & Industrial Research, Rafi Marg, New Delhi on or before the 10 Feb. 1969. Persons holding responsible positions in scientific and technological institutions, universities, governmental organizations and industry may also sponsor candidates along with the following information; (i) Name; (ii) Full postal address; (iii) Date and place of birth; (iv) Examinations passed and degrees and qualifications obtained with class or division year-wise, subjects taken and names of the institutions and the universities; (v) Countries visited, duration and purpose; (vi) Details of post-graduate work and list of publications with reprints; (vii) Details of how employed so far; and (viii) Names and addresses of three referees.

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CPHERI Develops New Coagulant Aids for Water Purification

In the past few years certain natural as well as synthetic substances have been used in conjunction with alum to improve the clarification of water. These have been called 'coagulant aids' as they help the process of coagulation in water treatment. The Central Public Health Engineering Research Institute (CPHERI), Nagpur has developed some new coagulant aids from indigenous raw materials. They have been coded: CA 3, CA 4, CA 5, CA 6 and CA 7. The raw materials used in the production of these coagulant aids are not toxic. The process of manufacture and products are under patent.

Investigation in pilot plants showed that the application of 5-10 mg/l coagulant aid resulted in 40-52 per cent saving in alum consumption. A series of investigations were made to determine the efficacy of the new coagulant aids as compared to the imported counterparts and it was found that they compare well.

Field trials with one of the coagulant aids in a 5 million gallon/day municipal water plant showed a saving in alum of 55 per cent on an average. The saving per year for a water treatment plant serving a population of a lakh at the rate of 30 gallons per capita/day was estimated at Rs 36,000. The coagulant aids produce dense flock and are effective in the concentration range, 2-10 mg/l. Ageing of these aids has no detrimental effect on the turbidity reduction. Coagulation of turbidity was unaffected by *p*H in the range 2-9; used as primary coagulants, without alum, they cannot however lower the turbidity below 300 mg/l. But used in conjunction with alum, the turbidity can be lowered to less than 20 mg/l. Split treatment with aid and alum is valuable in reducing alum concentration much more significantly, viz. 80-90 per cent.

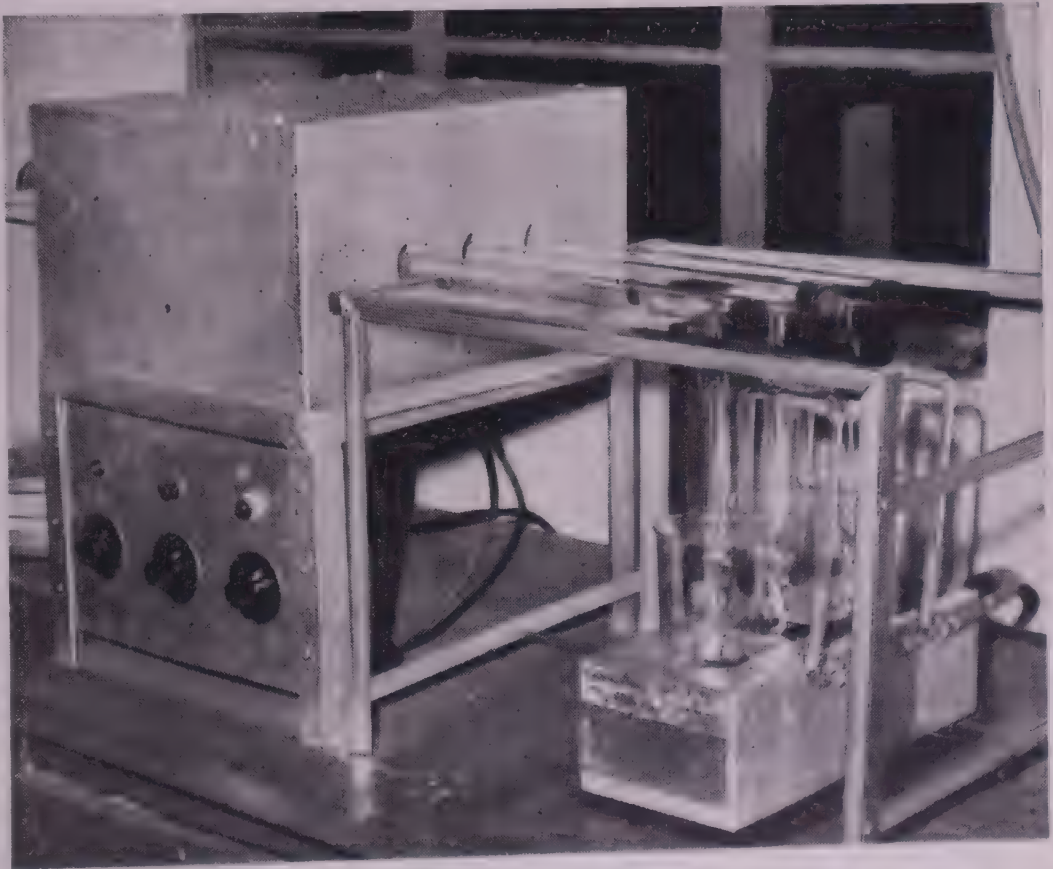
Prof. S. J. Arceivala, Director of the Institute has expressed the hope that these aids developed would help, first, by enabling municipalities to supply water of greater clarity and secondly by effecting economy in the consumption of alum which requires for its manufacture imported sulphur. These aids would be of use also in industrial waste treatment as well as in many chemical operations where solid-liquid separation is involved.

CFRI'S NEW EQUIPMENT
Gray-King LTC Furnace

A multiple-retort Gray-King (G.K.) low temperature carbonization (LTC) furnace with movable condensation train has been designed and fabricated at the Coal Survey Laboratory (Ranchi) of the Central Fuel Research Institute (CFRI), Dhanbad. The equipment consists of a stationary furnace housing three muffles suitably set for independent controlled heating while the condensation unit of the apparatus for tar collection is of movable type. The standard design of movable type of furnace incorporates a single muffle.

The commissioning of such a furnace had become necessary in view of the increased demands of G.K. coke type data. The laboratory has been able to successfully cope with the demand by giving as many as 9 coke types in a 7-hr day as against a single full G.K. experiment in the conventional way.

Experience with Indian coals has shown that caking index and G.K. coke type together provide better



Multiple-retort Gray-King LTC furnace designed and fabricated at CFRI Coal Survey Laboratory, Ranchi interpretation for laboratory assessment of the suitability of coals for metallurgical purposes. Coke type is also an important parameter for the newly developed codification of Indian coals and this makes the coke type an unavoidable routine test. As such, a laboratory engaged in routine coal analyses, dealing in particular with considerable number of borehole caking coal cores from prospecting by drilling in caking coal areas, has to turn out large number of samples for both these tests. Further, the likely deterioration in the caking qualities of coal during transit and storage imposes a sense of urgency in the determinations.

Barium Titanate from Glasses

Barium titanate, a ferro-electric solid, is widely used in such devices as microphones, phonograph pick-ups, under-water sound transducers, etc. The Central Glass & Ceramic Research Institute, Calcutta has carried out an investigation on the production of polycrystalline barium titanate from glasses. A glass composition having BaO, 55·5-57·5; TiO_2, 24·3-29·6; Al_2O_3, 6·4-6·7; SiO_2, 6·7-11·5; BaF_2, 0-2·0; and Fe, 0-0·5 wt per cent on crystallization gave tetragonal barium titanate as the major crystal phase along with $BaO.Al_2O_3.2SiO_2$. On crystallization the glasses having fluorides in the composition had a dielectric constant of about 730 (at 1 kc/s) and those having fluorides and iron, 940. Heating of glass at the rate of about 150°/hr from room temperature to 1150° and soaking for about 2 hr gave optimum dielectric constant values. The increase in density on crystallization was accompanied by increase in dielectric constant. There was an optimum in the size, *c.* 1 μ, of the crystals for the best set of values for dielectric constants.

Beneficiation of Low-grade Graphite

An investigation on the beneficiation of low grade graphite from Gangavaram mines, Mahbubabad, Andhra Pradesh has been carried out at the National Metallurgical Laboratory, Jamshedpur. The sample as received assayed C, 19·83; ash, 71·47; S, 1·03; vol. mat., 7·93; moisture, 0·77 and Fe (in ash), 6.06 per cent. Flotation employing a feed of 62·1 per cent — 200 mesh using pine oil as frother-collector and sodium silicate as depressant for siliceous gangue, followed by four cleanings of the rougher concentrate after regrinding yielded a concentrate assaying 32·18 ash. This product having very high ash content was not suitable even for foundry purposes. Flotation tests performed under identical conditions with the calcined sample (—10 mesh sample roasted at 925°C) yielded a graphite concentrate assaying C, 79·47; ash 18·24 and vol. mat., 2·12. This product is suitable for use in foundry and paint industry.

CBRI Annual Report: 1967

The Central Building Research Institute (CBRI), Roorkee has published its Annual Report for 1967. The 82-page report (Royal 8vo) summarizes the progress of work in the Institute's six main divisions, viz. Building Materials; Cement and Concrete; Soil Engineering; Efficiency of Buildings; Building Process, Plant and Productivity; and Architecture and Physical Planning. The report reveals that Cement and Concrete, which formed part of the Building Materials division, was converted into a separate division. Full scale factory trials on the production of cellular concrete from lime and fly ash have shown that the process would effect a saving of 40 per cent in the cost of raw materials as compared to the cement sand cellular concrete. A process for making magnesium oxychloride terrazo flooring tiles has been developed. It consists of forming under pressure a two-layered tile containing a well-proportioned mixture of magnesium oxide, sand, dolomite powder, marble chips and magnesium chloride solution. The method eliminates numerous moulds required in the non-pressure method, saves curing space and produces tiles of good dimensional stability.

In foundation engineering, investigations on large scale diameter piles and multi-underreamed piles have shown that considerable economy could be effected by using the latter type of piling.

A protractor for evaluating the sky component for the prevailing Indian sky conditions has been developed. By suitably placing it on the plan of the building, the sky component can be read off directly for a window size; conversely, the window size for obtaining a desired value of the sky component can be calculated. Tables of sky illumination distribution for different room ratios in terms of window sizes have also been worked out.

At the request of the Central Public Works Department, construction programmes based on critical path method were formulated for the construction of the annexe to the Vigyan Bhavan, New Delhi; consequently the project was executed well in time.

Alternative designs have been prepared for one-ton capacity grain storage structures for overground and underground usage. Performance tests on the structures are being carried out in collaboration with the Central Food Technological Research Institute, Mysore.

In Architecture and Physical Planning, a significant achievement has been the successful extension of the economic design for primary school buildings in various States. The Institute was also successful in persuading the States of Maharashtra and Goa, Daman and Diu to constitute development groups on school buildings.

Two extension cells of the Institute, one at Ahmedabad and another at Bhopal, were set up during the year.

The Institute compiled at the instance of the International Council for Building Research, Studies and Documentation a report entitled 'Selective examination and assessment of research in India in the field of housing and building applicable in developing countries'.

The report also reveals that the Institute took out five patents relating to: Volume change measuring apparatus, new corrosion inhibiting pigments, unit frame scaffolding, and new asbestos sprayer. The following four processes were leased to industry for commercialization: (1) Expansion joint filler from coconut pith and CNSL, (2) New formulation of cement paint, (3) Tamping machine, and (4) Method of laying foam concrete on shell and curved roof.

Centrifuge pulper

Flotation unit

JORHAT LABORATORY'S CONTRIBUTIONS TO PULP AND PAPER INDUSTRY

The Regional Research Laboratory (RRL), Jorhat one of the four regional laboratories of CSIR, undertakes research and development work towards efficient utilization of the natural resources of Assam and the surrounding areas. The resources tapped include coal, petroleum, limestone, bamboo, reeds and waste products like saw dust and tea waste. The Laboratory also tackles various problems arising out of the peculiar topography, humid climate and seismicity of the region. During the short span of four years since it started functioning as a full-fledged laboratory, this multi-disciplinary establishment has made useful contributions to the pulp, paper and building industries. It has developed processes for deinking of newspapers and a variety of products such as waxless carbon paper, parchment paper, dissolving grade pulp, binderless water-proof boards, decorative laminated sheets, pulp cement roofing boards and cellulose products. A salient feature of these processes and products is that only indigenous materials are used, as a result of which considerable saving in foreign exchange could be effected. The following are some of the new processes and products and special features.

Deinking of Newspapers

A process by which waste papers like letterheads, records and books can be converted to high grade pulp from which superior grade paper can be manufactured has been developed by the Laboratory. In this process, old papers are pulped in a hydropulper and subjected to flotation. Carbon released by the chemical comes up as froth and is skimmed off. The deinked pulp is converted into high quality white paper in conventional paper plants. Froth flotation cells, which can be indigenously fabricated, have been designed by the Laboratory. The cost of production of white paper would be about Rs 1000/ ton. The process can be adopted for deinking of newspapers. The newsprint produced from deinking newspaper possesses satisfactory strength properties and better printing qualities as compared to the newsprint manufactured by the National Newsprint & Paper Mills Ltd, Nepanagar (M.P.). The cost of production of newsprint works out to Rs 900/ ton as against Rs 1150/ton for imported newsprint.

Waxless Carbon Paper

Carbon paper is presently manufactured in the country using imported pulp and paper, microcrystalline wax, pigment and carbon black whose import bill totals about Rs 50 lakhs/annum. The Laboratory has developed a new surface coating process utilizing only indigenous paper. The coating composition is based on water and consists of a powdery substance, a binder, a dye and a colour carrier. All these chemicals are available indigenously. The carbonless paper can be manufactured in different colours and shades and the formulation can be applied on the back side of the paper. The total capital investment for a paper converter unit of 5 tons/day capacity is estimated at Rs 8.5 lakhs and the cost of production of carbon paper at Rs 1.50 per box as against the present market price of conventional carbon paper at Rs 12.50 per box.

Grease-proof Paper

This paper, which finds wide application in food packaging industry, is being manufactured in the country using imported pulp, but the indigenous production does not meet the country's demand. Imports in 1967 cost over Rs 56 lakhs. The Laboratory has developed a surface coating composition for the manufacture of grease-proof paper using indigenously available technical gelatine or glue, ammonium, sodium or potassium soap of stearic acid (or other fatty acids), formaldehyde and alum. The formulation can be applied to tissue, manifold, writing and printing papers. The capital outlay for a paper conversion plant of 5 tons/day capacity is estimated at Rs 7.5 lakhs and the production at Rs 2600/ton.

Parchment Paper

The requirements of this paper, which is used for dialysis and in packaging, etc. are entirely met by imports which are valued at about Rs 16 lakhs per year. The Laboratory has developed technical know-how and designed machinery for the manufacture of this paper. The process consists in the treatment of unsized and unfilled paper made out of preferably high alpha-cellulose pulp, with an acid under controlled conditions and removal of the acid from it with water and dilute ammonia. On treating the paper further with a plasticizing solution and subsequent drying and calendering, parchment paper is obtained. The cost of production is estimated at Rs 2800/ton.

Laminated Paper

A simple process for the manufacture of decorative thermosetting laminated sheets, which does not entail import of melamine-formaldehyde and phenol-formaldehyde resins, has been developed. The process of lamination consists essentially of impregnation of paper with a urea-formaldehyde resin and thermosetting the resin impregnated paper with a decorative paper upon the base material. The laminates are comparable in quality to those based on imported materials. The investment for producing 10,000 sq/m of laminated sheets/annum is about Rs 3.5 lakhs and the cost of production works out to be Rs 7 per sq m of the sheet.

Dissolving Grade Pulp

This is extensively used in the manufacture of rayon, and cellulose derivatives such as cellulose acetate, ethylcellulose and methylcellulose. It is usually manufactured by water or acid prehydrolysis sulphate process and subsequent multistage bleaching treatments. The Laboratory has developed a process based on the nitration of bamboo for preparing dissolving grade pulp in which pulp yields of 30 per cent and above with high cellulose content and low ash content are obtained. The main features of the process are that it does not require sulphur compounds and saves on alkali.

Water-proof Boards

A binderless process for making water-proof boards from agro-industrial wastes like paddy husk, saw dust, groundnut husk and bagasse, grass, reeds, tannery waste, etc. has been developed by the Laboratory. The advantage of the process is that it does not utilize urea-formaldehyde resins. T investment for a 10-ton/day capacity plant would be about Rs 20 lakhs and the cost of production 20 paise/sq ft of the board.

Pulp Cement Roofing Boards

The Laboratory has worked out a process for manufacturing pulp cement roofing boards which compare well with asbestos cement boards. The special feature of the product is that it replaces asbestos (presently imported for the purpose) by bamboo pulp; also it costs only half as much as asbestos cement boards. The investment for installing a plant of 50 tons/day capacity is about Rs 22 lakhs.

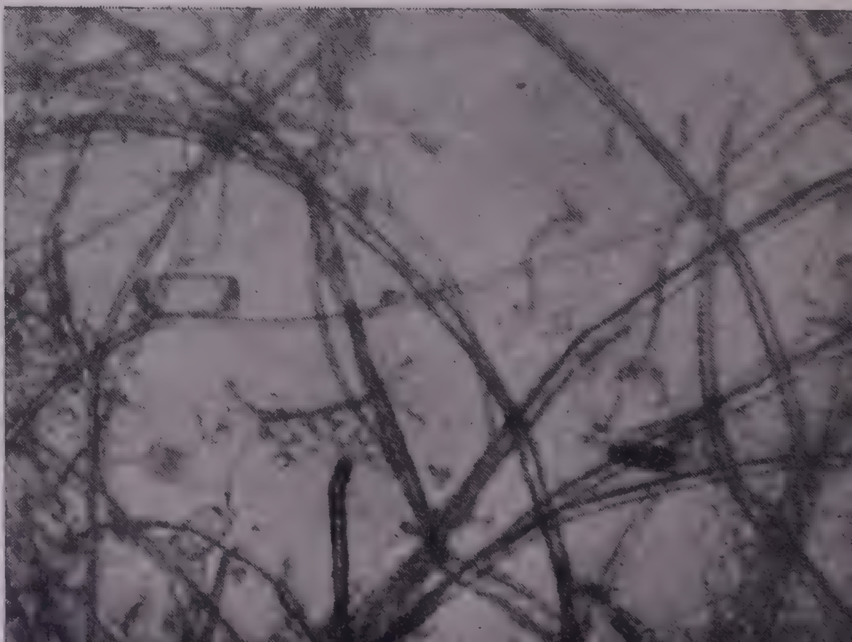
Cellulose Products

The Laboratory has worked out a process for microcrystalline cellulose which is presently imported. Microcrystalline cellulose finds application in food, cosmetics and pharmaceutical industries. It can be produced from high alpha-cellulose pulp from bamboo, reed and other cellulosic materials by controlled hydrolysis of the pulp and subsequent mechanical stirring of the hydrolyzed products.

The Laboratory has also worked out a process for benzylcellulose which can be used in plastics and paint industries. It has been prepared from high alpha-cellulose bamboo pulp by treating it first with alkali and then reacting the alkali cellulose with benzyl chloride.

Newspaper fibre before deinking

Deinked newspaper fibre



Water-proof board

Microcrystalline cellulose

TWO CECRI PROCESSES READY FOR COMMERCIAL UTILIZATION

Tin Oxide Resistors

Resistors form the major part of the components that go into the fabrication of communication and electronic equipment. Tin oxide resistors are a special class of film resistors and resemble metal film resistors in many respects. They are cheaper than metal film resistors, and have the following special features: (1) the oxide film formed on the substrate (glass or ceramic) is transparent, chemically stable, hard and resistant to abrasion; (2) the film is not affected by atmospheric moisture; (3) it is harder than the substrate and can be heated to incandescence without basically injuring the substrate; (4) the runaway failure which results with carbon film from reduced resistance at a hot spot does not occur with tin oxide resistors due to their excellent stability under sustained overload; (5) the oxide film can be formed comparatively to a greater thickness than that of carbon films; this contributes to improved stability and reliability of resistance; and (6) leakage at high operating temperatures, which is severe in other types of resistors, is absent in the case of the oxide resistors.

The requirement of tin oxide resistors for defence purposes alone is estimated at 4 millions per year.

The Central Electrochemical Research Institute (CECRI), Karaikudi has developed a process for the manufacture of metal oxide resistors (range, 10 ohm–2 kilo-ohm). In this process the tin oxide film is obtained by passing stannic chloride vapours on to the substrate kept at sufficiently high temperature; stannic chloride hydrolyses to form a hard and fairly uniform coating of tin oxide on the surface of the substrate. The tin oxide film is doped with a little antimony to impart stability, low resistivity and acceptable electrical characteristics.

The process has been studied on laboratory scale using 2 in. diam. silica for charging the substrates, the charge per batch of operation being 100 ceramic pieces.

The raw materials required are ceramic pieces, chlorides of tin and antimony, lead wires, solder, pins and marking silica tubes. The plant and machinery include chemical balance, tubular coating furnace, drying ovens, fractional horse-power motor, capping machine, spiralling machines, soldering pot, compressor, marking die and resistance bridge.

The total capital outlay for a plant capable of producing 1000 pieces of resistors per day of 8 hr has been estimated at Rs 63,750. The cost of production per piece comes to 35 paise.

Electrolytic o Aminophenol

o-Aminophenol is an intermediate in the synthesis of 8-hydroxyquinoline and is also used as the starting material for the preparation of optical whiteners. Other minor uses are as photographic developer, dye intermediate and tanning material. The country's entire requirements of about 80 tons per annum are met by import. The conventional method of producing this chemical by chemical reduction of *o*-nitrophenol using iron dust and hydrochloric acid has two disadvantages: (i) isolation of the product is difficult, and (ii) reduction is less efficient as compared to electrolytic reduction.

The Institute has developed a process for the production of *o*-aminophenol by electrochemical reduction of *o*-nitrophenol. The method involves the use of the rotating electrode technique developed in the Institute. A novel feature of the invention is the reduction of a suspension of *o*-nitrophenol in dilute sulphuric acid medium using rotating copper cathode at high current densities.

Pilot plant scale experiments in a 200 amp. cell have been carried out and data useful for designing 1000 or 3000 amp. cell have been obtained.

Consumer acceptability trials carried out at the National Chemical Laboratory, Poona and the Regional Research Laboratory, Hyderabad have shown the product to be of satisfactory quality.

The raw materials required are *o*-nitrophenol, sulphuric acid and washing soda; *o*-nitrophenol is to be imported.

The items of plant and machinery include rectifier, cells (glass-lined tanks with jacketed cooling), storage tanks, transfer pumps, steam distillation kettle, crystallizer unit, centrifuge, refrigeration unit, steam boiler, copper electrodes, lead sheet and porous pots. All are indigenously available.

The total capital outlay for a plant capable of producing 50 tons of *o*-aminophenol per year has been estimated at Rs 13 lakhs. The cost of production works out to about Rs 60 per kg.

Parties interested in undertaking the commercial development of the processes are invited to correspond with the Secretary, National Research Development Corporation of India, Mandi House, Lytton Road, New Delhi 1.

Thermal Response of Enclosures

This investigation formed the subject of research for the Ph.D. degree by Shri B. C. Raychaudhuri, Scientist, Central Mechanical Engineering Research Institute, Durgapur, who was awarded the degree (1968) by the Roorkee University.

The thermal response of enclosures exposed to transient as well as periodic external excitation has been studied primarily with a view to obtaining a comprehensive thermophysical parameter which would be useful in the realistic assessment of thermal characteristics of enclosures and enclosing elements.

A new concept of integrated thermal time-constant of an enclosure was first developed utilizing the thermal circuit representation of the mechanism of heat transmission and heat exchange in the enclosure. The enclosure could consist of any number of different types of composite walls, roof and floor, either all exposed or some only exposed. It might contain any other internal mass such as furniture and could be ventilated as well. It was also possible to take into account the indoor radiation and convection exchange between the internal surfaces of the enclosure separately. Consequently, this made easy the assessment of the thermal characteristics of the entire enclosure in terms of a single parameter.

Experimental methods for the determination of thermal time-constants of multilayered composite slabs or composite enclosures were also developed. The experimental values were more realistic as they took into account the existence of contact resistances which are not actually accounted for by available computational methods.

The theoretical computation of integrated thermal time-constants as developed above, although comparatively simple considering the large number of parameters which it could handle, was still complicated due to multilayered composite construction of the enclosing fabrics.

In order to simplify the computation procedure and also to obtain a more realistic prediction, three experimental methods have been developed for the determination of equivalent thermal diffusivity and conductivity of multilayered composite solid slabs, considering the composite solid as a homogeneous solid and the effective properties providing similar temperature variations at the exterior bounding surfaces under identical boundary conditions. These required the measurement of two surface temperatures, and the heat flow rates at one of the surfaces. The surface temperatures being used as empirical boundary conditions for the solution of one-dimensional heat diffusion equation, these methods permitted the use of thicker and hence multilayered composite solid slabs for the experimental determination of effective thermal diffusivity and conductivity.

The first method, meant for the laboratory determination of the effective properties, is based on transient excitation requiring two identical multilayered composite samples. The second method, based on variable excitation, is meant for the laboratory determination of the effective properties of multilayered composite solid slabs of large dimensions using the guarded hot-box apparatus. The third method is based on periodic excitation and is meant for *in situ* determination of the effective properties of building components exposed outdoors.

The study showed that the effective thermal properties are influenced by the constants of the excitation parameters obtained by the least-square method. It is, however, found experimentally that the effective thermal properties could be used for predicting the thermal response of enclosures exposed to corresponding external excitations. The experimental values of the effective properties are more realistic as these contained the effect of contact resistances, which is not usually accounted for. With these experimental values the thermal time-constants of the composite fabrics or of the composite enclosures could be more accurately computed. The influence of contact resistances, moisture or different external excitation parameter constants on the effective thermal conductivity was much greater than that on the effective thermal diffusivity of multilayered composite solid slabs.

SPONSORED RESEARCH

New Scheme

Charge and Spin Delocalization in Free Radicals

This new CSIR scheme is to commence under the supervision of Prof. P. T. Narasimhan in the Department of Chemistry, Indian Institute of Technology, Kanpur. The study of charge and spin delocalization in free radicals is of importance for understanding the chemical reactivity and electron spin resonance (ESR) spectra of free radical systems. Theoretical calculations of spin densities using unrestricted Hartree-Fock method have been successfully carried out for a number of conjugated systems by N. K. Ray and P. T. Narasimhan recently. It is proposed to extend these studies and also obtain experimental ESR spectra of free radicals in solutions to verify the theoretical results. The free radicals will be generated by both chemical and electrolytic methods. The project represents an integrated study of the spin density and charge density distributions in a number of π-delocalized systems.

Completed Schemes

Geology and Morphology of Orissa Coastline

This CSIR research project was initiated by Dr D. Niyogi and co-workers in the Department of Geology and Geophysics, Indian Institute of Technology, Kharagpur in Dec. 1965 with a view to investigating the geology and geomorphology of the loose sediments of Pleistocene and Recent age in the coastal areas of Orissa. The project is nearing completion.

The work was undertaken initially on air photographs and topographic mapsheets. The photogeomorphic maps prepared were checked on the basis of fieldwork in course of which sedimentological samples of representative landforms were also collected. Boundaries of different units were finally demarcated on 1 in. to a mile (1·65 cm to 1 km) scale topographic sheets on to which data from air photos were projected by photogrammetric techniques. Mapping was undertaken on this scale. In some areas however mapping was done on a larger scale (3·3 cm to 1 km).

Balasore shoreline—Geomorphic study of the origin and development of the 107 km long stretch of the shoreline near Balasore was undertaken on airphotos with necessary ground check-up. On the basis of five series of ancient beach ridges and four series of offshore bars, five previous positions of shorelines have been interpreted. Morphology of the lower reaches of the rivers Subarnarekha and Burhabalang reveals reliable evidences of a low stand of the sea level during the last Pleistocene glaciation and of a subsequent high stand of the restored post-Pleistocene sea level conforming to the most ancient of the interpreted shorelines. After the stabilization of the sea level at the present position some 3000 years back, shoreline development in the area was controlled mainly by regional uplift, coastal accretion and by compaction of sediments. Development of the Subarnarekha delta took place by alternate formation of beach ridges and offshore bars.

Subarnarekha delta—The delta of the Subarnarekha situated about 150 km south-west of Calcutta is over 17 km in width and is nearly 50 km lineally. A morphologic study of the delta has revealed the presence of beach and dune ridges, barrier bars, coastal terraces and deltaic flats. The formation of the delta started with the post-Pleistocene high stand of sea level, when the innermost line of beach ridges was formed. Subsequent extension of the delta progressed through alternate accretion of barrier bars and formation of beach ridges. Six cycles of beach ridge/barrier bar alternations are visible on the east bank of the river while only beach ridges are present on the west bank.

Lower reaches of the Subarnarekha—Fluvial morphology of the lower reaches of the Subarnarekha stretching from the sea level up to Ghatsila (a length of about 175 km) has been studied on airphotos and in the field. The entire length of the river studied is steeply entrenched and seven systems of step-like terraces are visible within this stretch at 75 m, 60 m, 50 m, 34 m, 20 m, 12 m and 9 m. The upper two terraces are seen as relatively narrow strips; so are the terraces at 20 m and 12 m. The 50 m terrace on the other hand is quite wide and is characterized by innumerable meander scars. The 34 m terrace is narrower but bears similar meander remnants. The 9 m terrace is unusually wide and has extremely intricate meanders. The river terraces are distinguishable by differences in levels as well as fluvial characteristics.

In the case of the Quaternary consolidated sediments where conventional mapping methods failed, it has been possible to separate stratigraphic horizons on the basis of geomorphic mapping. Six or seven such Quaternary formations have been delineated within the area; these are likely to belong to Upper (or Middle) Pleistocene. Chronology of Quaternary events in the area has been worked out. The ages of the formations have been worked out roughly.

Migration of Sulphate Ion in Red and Alluvial Soils

Limited availability of fertilizers, in the country necessitates greater utilization of the applied fertilizers. Keeping this in view the mechanism of nutrient migration towards the root zone in the soils has been investigated by Shri Mohamed Iqbal Ahmed, CSIR Research Fellow, under the guidance of Dr B. V. Subbiah, Senior Chemist, Nuclear Research Laboratory, IARI, in a CSIR sponsored scheme at the Indian Agricultural Research Institute (IARI), New Delhi during Oct. 1964 to Nov. 1967. The migration of a relatively mobile nutriention like sulphate in the downward, upward and lateral directions in red and alluvial soils has been studied using radioactive (^{35}S) sulphate under laboratory and greenhouse conditions.

The study has shown that the downward migration of sulphate ion increases with the increase in the amount of water as well as suction pressure applied, whereas soil compaction reduces the downward migration of the ion. Application of farmyard manure, urea and potassium chloride to red soil retards the downward movement of sulphate ion, whereas application of farmyard manure and monocalcium phosphate to an alluvial soil decreases the downward migration of the ion. Sulphate ion present in lower depth moves up with the capillary rise of water due to surface evaporation but the quantity of the ion that moves up is not proportional to the quantity of water lost due to discontinuity of large pores and loss of moisture in vapour phase. In general, the lateral movement of sulphate ion as a result of suction created by the evapotranspiration of rye plant is greater than the upward or downward movement. Migration of the ion was lesser in red soils than in alluvial soils, possibly due to the adsorption by kaolinite clay mineral.

The results suggest that frequent application of limited amounts of irrigation water (corresponding to the field capacity up to root zone) with alternate periods of drying and wetting is likely to lead not only to retention of the mobile nutrient like sulphate or nitrate ion but to frequent upward or downward movements of the nutrients within the root zone. This will enable the root surface to come into greater contact with the applied fertilizer and increase its utilization by the plant to greater extent, thus bringing about fertilizer economy.

Shri Ahmed, who on completion of the project submitted a thesis on the subject in partial fulfilment of the requirements for the doctorate degree, has been awarded the Ph.D. degree (1968) in soil science and agricultural chemistry by IARI.

Dr Atma Ram

Dr Atma Ram, Director General, Scientific & Industrial Research has been elected President of the National Institute of Sciences of India for 1969-70.

VISITORS

Mr Francis Wattier, Secretary General, International Coordinating Committee for the Presentation of Science and the Development of School Scientific Activities, Brussels visited the Birla Industrial & Technological Museum, Calcutta on 29 Nov. 1968.

Mr Robert M. Macy, UN Joint Inspection Unit, Geneva visited the Central Scientific Instruments Organization (CSIO), Chandigarh on 7 Nov. 1968. Other visitors to CSIO included Mr Nessim Shallon, Deputy Resident Representative, United Nations Development Programme, New Delhi (7 Nov. 1968); Mr E. T. Bridgewater, Unicef, New York (7 Nov. 1968); Mr V. N. Kukso, Unicef, New Delhi (7 Nov. 1968); Mr J. Hove, Liaison Officer, Unesco, New Delhi (13 Nov. 1968); Prof. W. D. Wright, Professor of Applied Optics, Imperial College of Science & Technology, London (3 Dec. 1968); Mr U. H. Kreuger, Unicef, New Delhi (4 Dec. 1968); and Prof S. A. Balezin, Chief Technical Adviser, Unesco, New Delhi (5 Dec. 1968).

Mr A. William, Department of Civil Engineering, University of Canterbury, New Zealand visited the Central Road Research Institute, New Delhi on 30 Dec. 1968.

Mr G. M. Bornet, Associate Director of Technical Research, International Institute of Cotton (IIC), Manchester visited the Bombay Textile Research Association (BTRA), Bombay on 17 Dec. 1968 and gave a talk on 'Aims and Research Activities of the International Institute for Cotton'. Referring to the consumption pattern of textile fibres, Mr Bornet said that there would be a significant reduction in the consumption of cotton in the coming years. An extensive market survey conducted by IIC has shown that cotton lacks the high level of wash/wear properties on which manufacturers of synthetic fibres lay stress. Lack of promotional activity in regard to cotton as a textile fibre and the comparative absence of 'fashion image' also contributed its relative decline. Mr Bornet, therefore, laid emphasis on the urgent need for making concerted effort to overcome these handicaps by modifying the cotton fibre characteristics so that it could stand competition and regain its importance against the expanding spectrum of synthetic fibres. With this end in view the IIC has sponsored some research projects in producing countries.

DEPUTATIONS

Dr A. B. Chatterjea, Scientist, NML, Jamshedpur returned on 27 Nov. 1968 after attending the second UN Inter-regional Symposium on Iron & Steel Industry held at Moscow during 10 Sept. to 9 Oct. 1968. After visiting several steel plants in Poland, he went to UK and visited some research and industrial organizations to acquaint himself with the design and operational aspects of iron and steel making pilot plants under the Exchange Programme between CSIR and the British Council.

Dr P. L. Ahuja, Scientist, NML, Jamshedpur resumed duty on 25 Nov. 1968 after completing 13 months' training in the field of metallurgy of alloy steels at the University of Sheffield under the Colombo Plan.

Two trainees from UAR, Mr Al Ansari and Mr Mohd. Fowzy, completed their training in the field of leather technology at the Central Leather Research Institute, Madras under the Indo-UAR Agreement for Scientific and Technical Cooperation.

Dr A. Lahiri, Director, Central Fuel Research Institute, Dhanbad left for Bangkok on 12 Jan. 1969 to attend as Government of India's representative the meetings of the ECAFE Advisory Council of Industrial Research during 13 to 22 Jan. 1969. ECAFE invited Dr Lahiri to prepare a basic document on 'An approach to cooperation in resources development in ECAFE countries'. Dr Lahiri will also take the opportunity to discuss with the Thai Government their project ,on lignite utilization for which CFRI had prepared a technical report.

Fruit and Vegetables Technology Training Course

A short-term (8-week) training course in *Fruit and Vegetables Technology* will start in the Central Food Technological Research Institute (CFTRI), Mysore from 24 Feb. 1969. The course will be of particular benefit to those directly associated with the fruit and vegetables preservation industry. Admission is open to graduates in science, agriculture or technology. Educational qualifications are however relaxable for those with experience in the line.

PATENTS

FILED

117402: *A self powered mechanical salt harvester*, Ram Parkash Dhiman—CSMCRI, Bhavnagar.

117404: *Scaffold hoist (manual)*, B. C. Srivastava & R. L. Gupta—CBRI, Roorkee.

117443: *Improvements in/or relating to the manufacture of liquid and solid pectin*, K. G. Nair, K. Narayana, K. C. Chikkappaji & H. C. Bhatnagar—CFTRI, Mysore.

118016: *Improvements in/or relating to electrode holder for the electrochemical marking of metals*, S. Guruswamy—CECRI, Karaikudi.

118017: *A process for making substitutes for Canada balsam*, J. G. Srivastava—NBG, Lucknow.

118188: *Improvements in and relating to manufacture and use of bricks or blocks for masonry work*, K. L. Arora, M. K. C. Nambiar, Y. C. Gokhale & M. S. Iyengar—RRL, Jorhat.

SEALED

98154: *A load cell*, B. Singh & R. K. Prasad—CMRS, Dhanbad.

100488: *Improvements in or relating to mechanical strength and resistance of glass or glass-crystal composites to thermal shock and chemical attack of vapours, liquids and solids*, S. Kumar & P. K. Gupta—CGCRI, Calcutta.

101162: *Improvements in or relating to carbonization of coal in narrow continuous vertical retort*, K. Y. Shrikhande, H. C. Chakravarti, V. V. Rao, N. N. D. Gupta, S. K. Das Gupta, S. Chatterjee, A. K. Moitra & A. Lahiri—CFRI, Jealgora.

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CSIR NEWS

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Tenth Textile Technology Conference

Sponsored jointly by the three cooperative cotton textile research associations, viz. the Ahmedabad Textile Industry's Research Association (ATIRA), Ahmedabad, the Bombay Textile Research Association (BTRA), Bombay and the South India Textile Research Association (SITRA), Coimbatore, the technological conferences are held annually in rotation at Ahmedabad, Bombay and Coimbatore. The tenth in the series was held at ATIRA, Ahmedabad during 21-23 Dec. 1968 (*CSIR News* Vol. 18, p. 93).

The Indian textile industry, predominantly cotton based, is passing through a critical period. The industry is afflicted with a number of maladies such as shortage of cotton, low labour and machine productivity, scarcity of power and water, crippling restrictions on the import of raw materials, auxiliaries and machinery. It is against this background that the deliberations of the conference are to be viewed. Thirty-five papers covering all aspects of cotton textile processing, from raw material selection to fabric finishing, were presented and discussed.

The properties of the finished product are largely governed by those of the raw material. Hence a study of the fibres and of the microscopic and submicroscopic arrangement of the structural element is the logical starting point in textile research. Microscopic and X-ray techniques of examining the structural features of fibres formed the subject-matter of some papers. Interferometric studies carried out at ATIRA on cotton fibres and twisted nylon filaments by the Tolansky method have provided strong evidence that the spiral structure of cotton is of the constant pitch type rather than of the equiangular type.

The regularity of arrangement of the fibres in a yarn is of profound importance in determining yarn quality. This is specially true of blended yarns in which fibres with widely different physical and chemical properties such as cotton, viscose, Terene, Orlon, etc. are mixed in order to combine the desirable properties of each fibre in the ultimate fabric. The effect of processing factors and fibre properties on the homogeneity of the resultant yarn was the subject-matter of a paper from BTRA.

The rate of yarn breakage in the final stage of spinning has a decisive influence on production. Because of an excessive breakage rate, the machine and labour productivity in Indian textile mills are among the lowest in the world. A host of factors like fibre properties, machine settings and speeds, atmospheric conditions of temperature and relative humidity in the spinning department affect the end breakage rate. These factors have been analysed and some practical recommendations suggested. For instance, it has been brought to light in a paper from SITRA that an atmospheric temperature of 21°C and a relative humidity of 41 per cent produce the least number of breaks during spinning. In general, high temperature with low humidities and low temperature with high humidities decrease spinning efficiency.

Basic studies aimed at an understanding of the mechanism of dye fixation of fibres, and other investigations on the effectiveness of certain chemicals in dyeing and printing formed the subject-matter of some papers. Three new types of dyes for wool, viz. halogenoanthraquinone derivatives, hydroxyanthraquinone derivatives, and halogeno azo dyes, have been reported in a paper from the Department of Chemical Technology, Bombay. Some of the dyes give very high degree of fixation on the fibre. The dyed fibres exhibit good light fastness in many cases. The colours studied range from yellow to blue.

Chemical processing treatments such as bleaching, mercerizing and dyeing consume considerable amounts of steam and water. In the interests of overall economy and in view of the water scarcity generally prevalent, it is desirable to reduce water and steam consumption without however sacrificing efficiency. Application of engineering and physical principles has enabled this goal to be attained.

An electronic instrument, the end break analyser, has been added to the list of instruments useful in quality control. The sophisticated instrumentation has made it possible to study the behaviour of the yarn after end break, and the effect of thick places and particles of foreign matter on the tension in the ballooning yarn.

Environmental Physics as applied to Buildings in Tropics

A three-day international symposium on the subject will be held at the Central Building Research Institute, Roorkee from 25 to 27 Feb. 1969. Papers will be presented and discussed on the following topics: (i) Heat and mass transfer through buildings, (ii) Climatology, (iii) Daylighting of buildings, and (iv) Building physics.

Shri M. M. Suri

Shri M. M. Suri relinquished charge of the office of Director, Central Mechanical Engineering Research Institute, Durgapur on 14 Dec. 1968. Shri N. V. Pandit, Scientist took charge of the duties of the Director.

CDRI Annual Report
1967

The Annual Report of the Central Drug Research Institute (CDRI), Lucknow has been published. The 176-page report (royal 8vo) describes the work of the Institute under the twelve major research and development projects with the aims and objects of each project set out in the beginning. The projects include: (1) Search for antifertility agents, (2) Drugs acting on the nervous system, (3) Cardiovascular drugs, (4) Experimental coronary heart diseases, (5) Chemical, pharmacological and pharmacognostic investigations of medicinal plants, (6) Screening of new compounds, (7) Process development of drugs and pharmaceuticals, (8) Antibiotics, (9) Chemotherapy of filariasis and other helminthic infections, (10) Chemotherapy of amoebiasis, (11) Chemotherapy of viral infections, and (12) Chemotherapy of tuberculosis and leprosy. The report reveals that six processes pertaining to the production of nitrofurantoin, furazolidone, amphetamine, methamphetamine, tocopherol concentrate and tryptone were standardized during the year. Laboratory synthesis of racemic ephedrine from acetylphenylcarbinol has been achieved and the process is now being scaled up in collaboration with the Antibiotics Project, Rishikesh.

Interesting results have been obtained in the study of cross-fertility between the filarial parasites *Litomosoides carinii*, *Chandlerella hawkingii* and *Wuchereria bancrofti*, the influence of various stimuli, including temperature, on micro-filarial periodicity and the relationship of this infection to the haematological picture of the jungle crows. Metabolic and enzymic studies indicate that *L. carinii* and *C. hawkingii* are equipped with enzymic machinery required for operating glycolytic reactions but not for the oxidative shunt.

Over 400 new compounds were synthesized and 170 were put through primary pharmacological screening. Two anti-convulsants with higher therapeutic index and quicker onset of action than dilantin, a currently used drug, have been found and are now under sub-acute toxicity tests.

The chemical structure of antibiotic X-340 has been established. Fermentation conditions for production of X-63, a potent antifugal agent, have been standardized with a view to scaling up the process at the Antibiotics Project, Rishikesh.

Studies on structure-activity relationship in a series of polymethylene quinolines have indicated that tetramethylene compounds have analgesic and local anaesthetic effect, while pentamethylene compounds cause marked respiratory stimulation and some of them show promise as analeptic agents. 2,3-Disubstituted benzoquinazolones and triazepino- and triazocino-quinazolones have been synthesized as possible CNS agents.

The report includes 8 appendices, important among them being the biological screening tests employed in the Institute; list of plants passed through primary screening; list of research and review papers published; and patents filed during the year.

Sixty research papers and review articles have been published and eight patents filed during the year.

CMRS Studies on Pneumoconiosis in Coal-miners

Mine workers need health and healthy environment for mining efficiency. Research on mine health, which covers studies on miners' diseases such as pneumoconiosis and silicosis, problems of industrial hygiene & physiology and mine air pollution come under the purview of the Mine Health division of the Central Mining Research Station (CMRS), Dhanbad.

Coal mining is a dusty occupation and is associated with health hazards. The various processes of coal mining result in production of huge amounts of dust; the dustiness depending on factors like the degree of mechanization, the coal output, the ventilation and humidity conditions in the mine, the size and nature of the mine, etc. The dust produced is a definite health hazard.

Inhalation of coal dust over a long period and in large concentration gives rise to the dangerous industrial disease, pneumoconiosis. Very fine airborne dust (1—5 μ diam.) which is invisible to the unaided eye is the causal agent. The disease in its different stages is diagnosable by X-ray of the chest. The damage to the lung tissues that constitutes pneumoconiosis cannot yet be attributed to any specific physical or chemical property of the dust. More research is needed to relate the composition, amount and size of dust to the incidence and growth of pneumoconiosis.

A recent survey carried out by CMRS in a colliery in Jharia coalfield has shown 35 (3·7%) definite cases and 106 (11·1%) suspected cases of pneumoconiosis in a batch of 952 underground cases included in the study. The result was obtained from the mass miniature radiography unit (70 mm film) of the Station.

The lung condition of the miners is being examined by taking chest X-ray. In addition, the study includes investigation of dust exposure and clinical examination of workers along with pathological abnormality studies.

Physiological studies are being made with a view to correlating pneumoconiosis with lung function. In the first phase, the study is being directed to establish physiological norms for an healthy being in the form of lung volumes and capacities and maximum breathing capacity. Correlation of lung volumes and capacities to different anthropometric measurements of body constitution, such as surface area, height, weight and trunk height and chest volume, has been taken up. These studies will provide data to show how far pneumoconiosis has hampered lung functioning.

The X-ray pictures of the lungs are being examined by a radiological panel. The data on the medical aspect of pneumoconiosis when correlated with the dustiness of the mine, are expected to provide a good picture of the relation between dustiness and its effect on the health of coal-miners. This would eventually help in formulating certain prophylactic measures against pneumoconiosis.

The Station is now engaged in an elaborate study of the problem in the Jharia coalfied in collaboration with the Rajendra Memorial Research Institute (Patna) staff and Dr R. Viswanatham, Emeritus Scientist of CSIR.

ENVIRONMENTAL PHYSICS AS APPLIED TO BUILDINGS IN TROPICS

Contributions of CBRI

The Efficiency of Buildings Division of the Central Building Research Institute (CBRI), Roorkee has been carrying out research work on the subject broadly under three heads: (i) Building climatology, (ii) Thermal characteristics of building components and enclosures, and (iii) Illumination.

BUILDING CLIMATOLOGY

Solar radiation

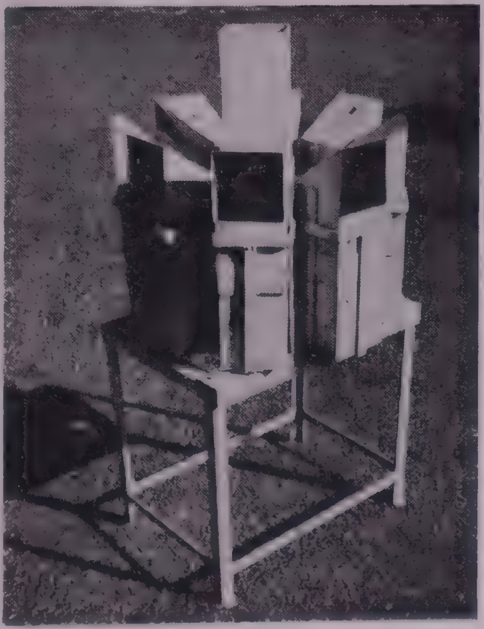
The characteristic features of tropical climate are high incident solar radiation and large diurnal variations of shade air temperatures. In order to determine the solar loads on buildings and their consequent effects on indoor climate, a quantitative knowledge of solar radiation intensities on horizontal, vertical and inclined surfaces of different orientations is a prerequisite, since the measured data on solar radiation are limited to horizontal surfaces. Also, such data are available for only a few places. A computational approach has been made to solve the problem. A set of curves has been prepared for clear days correlating direct solar radiation intensity on a surface normal to the sun's rays and solar altitude, precipitable water vapour, dust and ozone contents of atmosphere. From these the solar radiation data for any situation can be computed once the solar position in terms of azimuth and altitude is known. Solar charts, which provide the solar positions, at different times of the day and at different days of the year are prepared for all the Indian latitudes (8°N to 35°N). Protractors for use, in conjunction with the solar charts, have also been designed to help architects in designing the sun control devices for fenestrations and obtaining the desired solar radiation on various surfaces. All these data along with the usual climatic data on temperature, humidity and wind, for a large number of Indian cities have been processed and compiled as a ready reference book entitled, '*Climatological and solar data for India*'. Based on an analysis of the measured hourly intensities of solar radiations at New Delhi, a relationship has been derived between the diffuse and direct radiation on average days.

Temperature & humidity

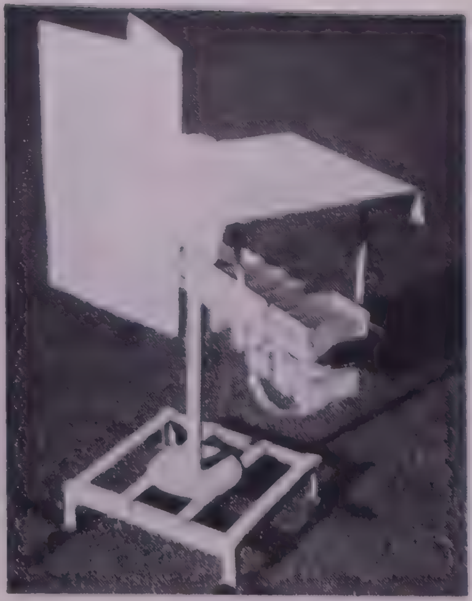
Single values of design dry bulb and wet bulb temperatures, average values, and degree days are useful for steady state heat flow calculations and these are commonly used in temperate and cold climates. But these are not adequate for periodic heat flow computations which have to be used in tropical climates. Major changes in computational methods and greater stress laid on the precision of the estimates have necessitated the determination of hourly coincident weather data for design days. The Institute is currently engaged in the production of such reference data combining all the climatic elements into a single equivalent factor which would serve for all major cities of the country.

Driving rain

To allow free air-movement inside a building during the hot-humid period and during raining spells, it is important to keep the windows open and to keep the rain-water out. For this purpose, studies on 'Driving Rain' were conducted and they have revealed that the *chajja* projection over a window opening should cover up to 30° slanting rainfall. Suitable instruments to determine average desirable *chajja* projections in different regions of the country have been designed and installed at a few places in the country.



Instrument developed by CBRI for determining driving rain on various vertical surfaces



Instrument developed by CBRI for determining the scale of angle of driving rain

THERMAL CHARACTERISTICS OF BUILDING COMPONENTS AND ENCLOSURES

The aim of investigations under this head is to establish reliable methods for evolving economical thermal design of buildings for a given climatic region. It involves a critical study of various methods employed for the precise evaluation of thermal performance of building components, the estimation of heating and cooling loads and indoor air temperatures under varied climatic conditions. A fully verified theoretical computational approach will only be able to tackle the problem of this magnitude. High speed digital computers have made it a practical proposition. The final solutions, i.e. economical alternative designs which would provide the required thermal conditions inside a building, can be presented in the form of a reference book for the use of architects and engineers. Work at this Institute on both the experimental and theoretical investigations is directed with this object in view.

Thermal conductivity apparatus developed by CBRI

Experimental investigations

Field studies. A field investigation was carried out on 40 full scale unoccupied houses built during the 'International Low Cost Housing Exhibition' held at New Delhi in 1955-56. The objective of these investigations was 'to study under natural climatic exposure different aspects of heat transmission, ventilation and damp penetration'. These houses had different types of constructions, internal layouts, window openings and orientation. Thermal damping (D), expressed by $D=[(T_o-T_i)/T_o]\times 100$ (where T_o and T_i are outside and inside ranges of temperature variations), was determined and the relation between these characteristics and the thermal time constant (Q/u) of the enclosing wall and roof sections was established.

Detailed experimental investigations were carried out in eight specially designed full-size test units to evolve economic, durable and thermally efficient specifications for any given outdoor climatic condition. Both insulated and uninsulated buildings were studied. The studies have shown that the thermal damping of building fabrics is a function of thermal time constant (Q/u). It has been further established that a thermal time constant value of 20 hr is an optimal value. A suitable combination of an insulation layer and masonry could yield the optimal (Q/u) with a subsequent reduction in weight of construction.

Ceiling height studies. An experimental study has been made on the effect of ceiling height on indoor air temperature. The results indicate that no substantial advantage is derived by increasing the ceiling heights from 2·8 to 3·6 m. It is more economical to reduce surface temperatures of the ceilings by some treatment. Studies on the effect of orientation confirm that a south oriented (long axis facing south) would result in lower indoor air temperatures. Field experiments are presently being carried out on the diurnal and seasonal variations of thermal conductance of commonly used building sections, which would provide useful data for the computational methods.

Technical aid to industry. Test facilities for the determination of thermal conductivity of building and insulating materials at normal and low temperatures and the overall transmission coefficients of prototype wall and roof sections have been made available to the industry. The insulation industry is showing considerable interest in making best use of these facilities.

Theoretical methods

Thermal characteristics of building components. Of equal importance in achieving precise estimations of air-conditioning loads and prediction of indoor air temperatures is the availability of thermal characteristics (steady state and periodic) of building sections. Most of the data books provide extensive tables of design heat transmission coefficients (u values) for a large number of building constructions. Although the importance of periodic and transient heat flow characteristics of building sections are often stressed, they are not yet available in the form of reference tables for wide use. This has imposed severe restrictions on the use of computational methods. The Institute has employed electrical analogue (RC network analyser developed at the Institute) and digital computer methods for these purposes. It has been shown that for a complete description of the thermal behaviour of building sections, three functions, one transfer and two driving point, are required. These functions have been determined for a large number of building sections (single layer as well as multilayer) which will be independent of the actual climatic variations and thus have much wider application.

Thermal performance of enclosures (weighting functions). Theoretical investigations on transient thermal response of enclosures, when the outdoor temperature follows any arbitrary functions have been carried out. Analytical solutions to compute the 'Weighting Functions', the characteristics of which depend on thermal properties and ventilation of the

RC network heat flow analyser developed by CBRI for solving heat transfer problems

Flat type artificial sky set up by CBRI for model studies of daylighting in buildings

enclosure have been developed. The use of these functions has been extended to enclosures having walls and roofs of composite construction such as cavity walls and insulated walls with a cladding of external or internal insulation.

A method has been developed for theoretical computation of the integrated thermal time constant of enclosures, which may consist of any number of different types of composite walls, roof and floor, and which may contain internal masses such as furniture with or without ventilation. It is also possible to take into account the indoor radiation exchanges between the internal surfaces of the enclosure separately. This simplifies the assessment of the thermal characteristics of the entire enclosure in terms of a single parameter. Of the various mathematical methods the matrix method has several advantages and is very easily adaptable for high speed digital computation. The reliability and the potentialities of the matrix method in predicting indoor air temperatures and the air-conditioning loads under practical situations have been demonstrated through experimental verifications on test buildings.

The Institute's work on the computer application to the thermal design of buildings is oriented towards the use of pretabulated data on periodic and transient thermal characteristics of individual building components and the design sol-air temperature data for places of interest and to compute the indoor air temperatures and thermal loads. This approach has the advantage of being more flexible while studying the effect of variations made in individual components on the overall thermal behaviour of structures and also eliminates the need of employing large computers.

ILLUMINATION

Clear design sky

The International Commission on Illumination (CIE) at its Zurich Conference in 1955 adopted the luminance distribution of an overcast sky as the basis of daylighting design of buildings. The luminance distribution of this type of sky is represented by Moon and Spencer's empirical equation:

$$L_\theta = (L_z/3)\,(1 + 2\sin\theta)$$

where L_θ is the luminance at an angle θ above the horizon, and L_z, the luminance at zenith. The adoption of Moon and Spencer's overcast sky is most suited for west European countries where the skies are generally overcast. But for warm arid climates where clear sky conditions prevail the use of CIE sky invariably results in the overdesign of window areas and very often in uncomfortable environment.

The skies in the plains of India are generally clear blue except during the monsoon. In order to determine the luminance distribution and daylight availability under the prevalent clear sky conditions, measurements were carried out by CBRI in principal regions of India during the past few years. The frequency analysis of daylight availability showed that the clear blue sky with the sun at an altitude of 15° could form an appropriate basis for daylighting design in this country. In order to provide adequate daylight indoors in the absence of direct sunlight, the critical half of the sky opposite the sun has been chosen as the clear design sky. Since the daylight availability is enhanced as the sun moves to higher altitudes, the clear design sky ensures adequate daylight indoors for more than 85 per cent of the working hours. Further, the increase of indoor illumination over the design value lies within reasonable limits due to the flatness of luminance distribution at higher solar altitudes. Thus the clear design sky basis provides almost consistent daylight levels for most of the working hours. The luminance distribution of the clear design sky is given by the equations: (1) L_θ = constant, for θ up to 15°, and (2) $L_\theta = L_M \operatorname{cosec}\theta$, for θ between 15 and 90°, where L_θ is the luminance at an angle θ above the horizon, and L_M is the observed minimum sky luminance. The position of minimum sky luminance in the sky lies between 70° and 90° away from the sun on the great circle passing through the sun and the zenith. The minimum sky luminance has been found to bear a linear relationship with the sky illumination (diffuse) on the horizontal plane.

The clear design sky has now been adopted by the Indian Standards Institution as the basis of daylighting design in this country. The exterior design illumination has been taken as 8000 lux.

Daylighting design aids

Exact mathematical equations for sidelit windows under the clear design sky have been derived and computerized. These results have now been projected on protractors which can be used on the plan of a building for assessment of sky components due to the clear design sky on a horizontal work plane or a vertical plane parallel or perpendicular to the window.

Nomograms have also been prepared which can be used for estimating the expected daylight levels at the room centre. Conversely, these nomograms can be utilized for the predetermination of window sizes in terms of percentage of the floor areas.

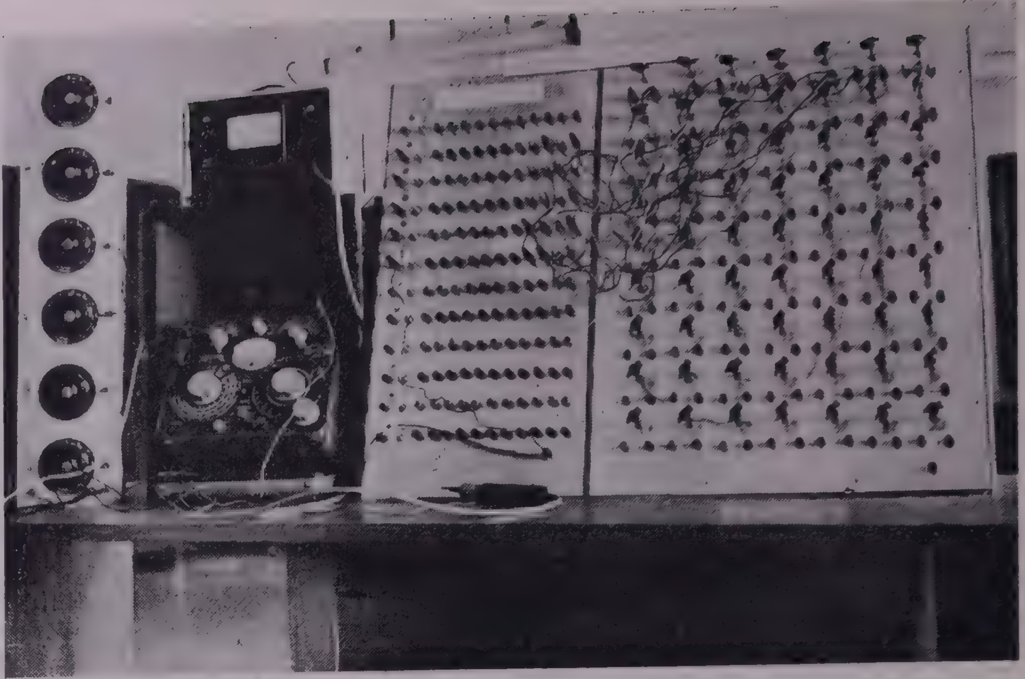
The work on inter-reflection of daylight in buildings has been finalized and the tables of total daylight factors incorporating the inter-reflected component for all possible combinations of interior finishes have been prepared. These tables of daylight factors directly indicate the fenestration percentage of the floor area for obtaining the desired illumination on the work plane.

Comprehensive studies have been made in the Institute on daylighting through northlight openings. The studies have shown that the bay width and the roof slope can be suitably adjusted for obtaining uniform, shadow-free illumination. This can be achieved because considerable amount of sunlight is reflected from the ceilings in saw-tooth northlight buildings. The study has also shown that sawtooth type of roofs provide better illumination than the shell type of roofs.

The studies on daylighting in multistoreyed buildings have also been made by model measurements and theoretical computations. These investigations show that the advantage of reflected sunlight can only be taken when the separation to height ratios of building blocks exceeds 1·5.

The Institute has a dome sky of 24 ft diameter as well as a flat type of artificial sky simulating the clear design sky for studies with scaled models. A twelve surface electric analogue system has recently been set up for solving the problem of inter-reflections in buildings.

The Institute has undertaken a Unesco sponsored project on measurements of sky luminance and daylight availability in South East Asian countries for providing guidelines on daylighting design of schools in these countries.



Luminous analogue computer developed by CBRI for solving problems of inter-reflections in buildings

Kinetics and Mechanism of Solid State Reaction in MgO-Cr_2O_3 System

The award of D.Sc. degree to Shri K. Hanumanlu of the Regional Research Laboratory, Hyderabad for his studies on the above subject by the Faculty of Ceramics, Mining and Metallurgy, Cracow (Poland) has been announced (*CSIR News*, Vol. 18, p. 96). A brief resume of the investigations is given below.

On the basis of chemical determination of the conversion as a function of time and temperature of annealing, kinetics of this process has been analysed and a hypothesis explaining its mechanism has been formulated. The hypothesis has been confirmed by extensive studies of the phase composition, carried out by means of X-ray analysis and measurements of surface area and valence state of chromium ions.

On the basis of experimental data it has been concluded that the mechanism of the solid state reaction in the powdered mixture of magnesium oxide and chromium oxide proceeds through the following steps:

(i) coverage of MgO grains with chromium oxide leading to the formation of a thin layer of magnesium chromate, $2MgO + Cr_2O_3 + \frac{3}{2}O_2 \rightarrow 2MgCrO_4$, alternatively $MgO + CrO_3 \rightarrow MgCrO_4$ depending on whether chromium oxide is transported in the form of tri- or hexavalent chromium compound;

(ii) formation of a thin layer of spinel on the surface of MgO grains;

(iii) growing of the product layer inward into the grains of MgO, Cr_2O_3 being transported by diffusion of chromium ions through this layer to the MgO/spinel interface at which the reaction proceeds. In the third step the rate of the reaction is determined by the rate of the diffusion of chromium ions through the spinel.

The influence of altervalent ions on the kinetics of the reaction has also been studied. On the basis of the crystal field theory, it was proved that depending on the site preference energy, altervalent ions are incorporated in tetrahedral or octahedral sites of the spinel lattice respectively, changing accordingly the defect equilibria and influencing the rate of diffusion of chromium ions.

It has been earlier pointed out that in the first step of the reaction, a surface layer of spinel on MgO grains is formed. The conversion is higher, greater the surface area of MgO. In the course of annealing, the surface area of MgO decreases as a result of sintering and observed conversion is a function of two factors: the rate of formation of the surface layer of spinel and the rate of decrease of MgO surface area. Any factor which prevents the sintering of the surface area would increase the conversion in the first step of the reaction.

The sintering of MgO has lately been investigated by Leonov who listed the additives in order of their increasing influence on the sintering of MgO as: TiO_2, B_2O_3, ZrO_2, Al_2O_3, MgO, CaO, Na_2O, K_2O.

Potassium ion exerts the strongest inhibiting influence on the sintering of MgO. This would explain its highest accelerating effect on the spinel formation observed in the present study. Further investigations are needed to confirm the mechanism of the reaction.

VISITORS

Dr Triguna Sen, Union Minister for Education and Vice-President, CSIR visited the Regional Research Laboratory, Hyderabad on 8 Jan. 1969.

Prof. Abdul Ghafoor Quaisani, Afghan Acacemy of Sciences, Afghanistan visited the Central Road Research Institute (CRRI), New Delhi on 15 Jan. 1969. Other visitors to CRRI included Dr G. A. Leonards, Professor of Soil Mechanics and Head of the Civil Engineering School, Purdue University, USA (22 Jan. 1969); and Mr J. D. Mc Intosh, Head of Technical Secretariat, Cement and Concrete Association, England (29 Jan. 1969).

TWO RRL PROCESSES READY FOR COMMERCIAL UTILIZATION

Acid Oil and Distilled Fatty Acid from Low-grade Soapstock

Acid oil can be used directly for the manufacture of once-distilled fatty acids which find extensive application in the manufacture of soaps, cosmetics, lubricating greases, rubber goods, surface active agents, etc. Acid oil can also be used directly for the manufacture of low-grade soaps.

At present 10,000 tonnes of distilled fatty acids are being produced per annum in India. The requirement of fatty acids in 1970 is estimated at 18,000-20,000 tonnes/annum. A small quantity of the requirement is met by imports.

Hydrogenated groundnut oil, imported tallow and palm oil are at present being used for the production of distilled fatty acids in the country. To a limited extent, nonedible oils like *nim*, *mahua* and rice bran oils are also being split and distilled. In the past, attempts to use cottonseed acid oil for distillation have been made; but because of the poor quality of the starting materials, the results have not been encouraging.

The Regional Research Laboratory (RRL), Hyderabad has developed a process for the manufacture of acid oil and distilled fatty acids from low-grade cottonseed soapstock. The new process envisages the pretreatment and acidification of soapstock by which most of the extraneous impurities is washed free of mineral acids and purified by conventional methods.

The process developed by RRL compares favourably with the production of distilled fatty acids by high pressure splitting of the oil followed by vacuum distillation. Production of distilled fatty acids from cottonseed soapstock does not require high pressure autoclaves and allied accessories.

The composition of acid oil obtained from soapstock, fresh as well as old, is as follows (values in parentheses being those of acid oil from old soapstock): total fatty matter, 75-90 (50-70); neutral oil 2-5 (2-4); oxidized fatty acids, 4-8 (15-30); and moisture 3-6 (5-10) per cent. The characteristics of once-distilled acid (cream coloured semi-solid) are: acid val., 200-206; sap. val., 202-208; iodine val., 80-100; and titre 0°C, 37-41.

The process has been studied on a pilot plant scale of 500 kg of soapstock per batch for acidification, and 100 kg of acid oil per batch during distillation. The yield of distilled fatty acids is about 75 per cent based on the total fatty matter of soapstock.

Cottonseed oil soapstock, sodium hydroxide and commercial sulphuric acid are the main raw materials required for the process. All are available in the country.

The total capital outlay for an independent plant to convert 5 tonnes of soapstock to acid oil is estimated at Rs 5·05 lakhs and to convert the soapstock to distilled fatty acids at Rs 8·00 lakhs. However, for existing fatty acid distillation and cottonseed oil refineries, the capital outlay will be much less. The cost of production of acid oil and once-distilled fatty acid has been estimated at about Rs 1·60 and Rs 3·70 per kg respectively.

Manufacture of Bleaching Earths

Bleaching earths are widely used in the decolorization of vegetable oils, fatty acids, etc. These earths are being produced in the country by two firms. Their present annual production is about 3500 tonnes. Indigenous production is far short of the demand (5000 tonnes) in the country, which is expected to further increase.

The Regional Research Laboratory, Hyderabad, which has been engaged in developing activated earths from bentonite and fuller's earth for bleaching purposes, has successfully worked out a process according to which the natural earth is processed and activated under controlled conditions. The bleaching earth developed by the Laboratory is comparable to imported earths.

Bentonite, fuller's earth and mineral acids are the main raw materials required in the process. The total capital outlay for putting up a plant capable of producing 1500 tonnes per annum has been estimated at Rs 6·20 lakhs. The cost of production works out at Rs 600 per tonne against the current market price of about Rs 700-900 per tonne. The c.i.f. value of the imported earth is about Rs 1700 per tonne.

Parties interested in undertaking the commercial development of the processes are invited to correspond with the Secretary, National Research Development Corporation of India, Mandi House, Lytton Road, New Delhi 1.

SPONSORED RESEARCH

New Schemes

Studies on Lysozyme

A new CSIR scheme under the title, Chemical modification of lysozyme for biological activity and sedimentation, has commenced at the Chemistry Department, Karnatak University, Dharwar. The object of this research scheme (principal investigator: Dr M. P. Venkatappa) is to locate the amino acid residues of lysozyme, an enzyme present in hen egg-white, by chemical modification of the enzyme using specific heavy atom reagents.

The residues will be located by enzymatic degradation of the heat-denatured modified lysozyme and by subsequent paper electrophoresis or finger prints of the digests. It is also intended to study the effect of chemical modification on biological activity, intrinsic viscosity, ultraviolet spectrum, titration, and electrophoretic and sedimentation behaviour of the enzyme. The studies are expected to give an insight into the relation between the structure and activity of the enzyme as well as the mechanism of the biological function of lysozyme.

Total Synthesis of Steroidal Alkaloids

This new CSIR scheme has been taken up by Dr S. V. Kessar (principal investigator), Dr A. L. Rampal (co-principal investigator) and two Research Fellows at the Chemistry Department, Panjab University, Chandigarh. The object of the scheme is to develop synthetic routes for steroidal alkaloids having a nitrogen atom in ring F. The approach envisaged involves a critical Michael addition reaction of a nitro-alkane having requisite functional groups with a tetracyclic α, β-unsaturated ketone. Elaboration of the remaining rings from the adduct is expected to be feasible. One α, β-unsaturated ketone when reacted with different nitro-alkanes will lead to a number of members of a particular sub-group. The problem, therefore, in its course involves synthesis of two α, β-unsaturated tetracyclic ketones and a few complex nitro-alkanes.

The approach is expected to take care of the stereochemical complexity arising from the presence of numerous asymmetric centres. It is also proposed to utilize relay materials obtained by degradation of natural alkaloids. Lastly, nitrogenous intermediates, which are likely to be obtained, will be examined for their physiological effects.

BITM opens Regional Museum at Raiganj

A new Regional Science Museum of the Birla Industrial & Technological Museum (BITM), Calcutta was inaugurated at Raiganj (West Dinajpur) on 12 Jan. 1969.

The science museum consisting of 30 attractive working exhibits on 'the Story of Electricity' will cater to the needs of the students and the public of the district. The activities of the centre, which is 425 km away from Calcutta, includes: school demonstration lectures, creative abilities centre for the rural schools, scientific and technical film shows at villages, competitive students' science seminars, model making competitions, teachers training programme, etc.

Flour Milling and Baking Technology

An eight weeks' training course in flour milling and baking technology will start in the Central Food Technological Research Institute, Mysore from 3 March 1969.

Training will be imparted in: principles and practices of flour milling, design, construction and operation of flour mills, flour storage and infestation control in flour mills and bakeries, baking, mechanical development of dough, dilution of strong flours with weak flours, biscuit and cake production including protein supplementation, and packaging, handling and shelf-life of bakery products.

New Doctorates

Dr S. Z. Qasim, National Institute of Oceanography—D.Sc. (University of Wales, UK); thesis: *Contributions to ecology and experimental biology of fishes and other aquatic animals and to environmental studies* (47 published papers). Dr Qasim is a Ph.D. from the same university.

Shri D. C. Parashar, NPL, New Delhi—Ph.D. (Delhi University); thesis: *Cation diffusion, electrical conduction and optical absorption in pure and doped KCl, KI and NaCl crystals* (Guide: Dr S. C. Jain).

Shri R. N. Thakur, RRL, Jammu — Ph.D. (Agra University); thesis: *Studies on variation in pathogenicity of* Fusarium oxysporum *in India* (Guide: Dr Akhtar Husain).

DEPUTATIONS

Shri A. S. Lakshmanan, Scientist, CECRI, Karaikudi proceeded to UK on 1 Dec. 1968 for four months' training in 'Oxide semi-conductors, especially zinc oxide and electrostatic photography' under the Programme for Exchange of Scientists between CSIR and the British Council.

Dr N. S. Srinivasan, Scientist, CRRI, New Delhi left for Thailand on 30 Dec. 1968 to take up a five-month assignment with the ECAFE, Bangkok.

Dr Baini Prashad

We record with deep regret the passing away of Dr Baini Prashad in Calcutta on 18 January 1969.

Born on 13 April 1894, Baini Prashad obtained his D.Sc. degree from the Panjab University in 1918. Starting his career as an assistant professor of zoology in Government College, Lahore in 1916 he rose to the directorship of the Zoological Survey of India in 1933. He was appointed Fisheries Development Adviser to the Government of India, retiring in 1953.

Dr Baini Prashad was President of the Zoology Section, Indian Science Congress in 1923 and President of the National Institute of Sciences of India during 1942-43. He was a fellow of the Royal Society of Edinburgh, Zoological Society, London and Asiatic Society, Calcutta. He published over two hundred papers.

His association with the CSIR has been long and close. He served with distinction on the Biological Research Committee. He was a member of the Editorial Committee of the Wealth of India during 1948-66. He was Hony Editor, Zoology Unit, Publications & Information Directorate, CSIR for the period 1957-66. Dr Baini Prashad gave liberally of his time and expertise to CSIR's endeavours in biological research and dissemination of scientific information through publications.

PATENTS

FILED

117677: *Process for the preparation of shellac-acrylic emulsions for use in leather, textiles, paint and adhesives*, V. V. Subramanian, S. Sareja & Y. Nayudamma — CLRI, Madras.

117972: *An improved process for the production of aluminium fluoride*, B. C. Kar—NML, Jamshedpur.

118034: *Constant stress viscometer*, S. S. Chari & B. R. Awasthy—NPL, New Delhi.

118189: *A new process for the production of carbon black from coal*, M. S. Iyengar, R. Haque, S. K. Chakrabarti, M. L. Dutta & A. K. Singh—RRL, Jorhat.

ACCEPTED

103065: *Improvements in or relating to braced domes*, B. Y. Ballal, E. A. Karim, M. Ramaiah, Z. George & G. S. Ramaswamy—SERC, Roorkee.

108583: *Chemically bonded forsterite refractories and methods of their preparation*, M. C. Kundra & H. P. S. Murthy—NML, Jamshedpur.

108703: *Improvements in or relating to the manufacture of high alumina refractories*, J. C. Banerjee, N. B. Chatterjee & N. B. Panti—CGCRI, Calcutta.

109082: *A process for the production of active carbon from coconut shell*, S. Banerjee, R. K Chakravarty, A. Dutt, N. G. Basak & A. Lahiri—CFRI, Jealgora.

109755: *Improvements in or relating to the process for preparation of disinfectant grade creosote oil primary tars*, D. P. Agrawal, A. Vijayasarathi & R. Vaidyeswaran—RRL, Hyderabad.

110134: *Preparation of 3-bis chloromethyl oxacyclobutane polymers*, Ajai Prakash, S. K. Patra, M. Krishnan & R. T. Thampy—SRIFIR, New Delhi.

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CSIR NEWS

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'rof. V. K. R. V. Rao takes over as Vice-President, CSIR

:of. V. K. R. V. Rao, Union
linister of Education & Youth
ervices took over as Vice-President,
ouncil of Scientific & Industrial
esearch on 14 Feb. 1969. Prof.
ao has been associated with CSIR
a member of its Governing
ody.

Born on 7 July 1908, Prof. Rao
d his education at the universities
Bombay and Cambridge. He is
M.A. of the Bombay University
d took his B.A. and Ph.D. degrees
om Cambridge.

Prof. Rao was Principal and
ofessor of Economics in the S.L.D.
ts College, Ahmedabad before he
ned the University of Delhi as
ofessor and Head, Department of
onomics in 1942. Founder of the
lhi School of Economics, a pre-
er institution for research and
ining in economics, he was its
t Director. He was the Vice-
ancellor of the University of Delhi
three years and later returned to
demic work on a full-time basis
Chief of the Institute of Economic
wth, which he himself had pro-
ted. On the invitation of the
ernment of India, Prof. Rao
ed the Planning Commission as
mber. He continued to main-
his academic connection with
Institute and was Emeritus
fessor of Economics at the Uni-
ity for some time. Prof. Rao was
ointed Union Minister of Trans-
and Shipping in 1967. He
over as Minister of Education
Youth Services on 14 Feb. 1969.

'rof. Rao was Member and
irman of the United Nations
Commission on Economic
elopment during 1947-50. He
lso acted as Food Adviser to the
rnment of India. He has been
orrespondent Member of the
tute de Science Economique

Applique, Paris; Correspondent for India to the Royal Economic Society, London; Member of the Governing Council of the International Association for Research in Income and Wealth; and President of the Indian Economic Association. He is a member of the International Statistical Institute. Prof. Rao has also served on a number of important committees and commissions appointed by the Government of India, such as the Taxation Enquiry Commission, Press Commission, National Income Committee and Planning Commission's Advisory Board, Panel of Economists, and Panel of Education. He was the Chairman: Programme Evaluation Board of the Planning Commission, Steering Committee of the Indian Conference on Research in National Income, Governing Body of the Demographic Training and Research Centre, and Demographic Research Advisory Committee of the Government of India.

Prof. Rao has to his credit a number of books on economics which have won international fame, and is known especially for his pioneering work on India's national income. The other subjects in which he has specialized are money and employment, public finance and economic development.

Prof. Rao visits CSIR

Prof. V. K. R. V. Rao, Union Minister of Education & Youth Services, and Vice-President, CSIR visited CSIR headquarters, New Delhi on 18 Feb. 1969. Dr Atma Ram, Director General, Scientific & Industrial Research, welcomed the new Vice-President. Addressing the scientists, Prof. Rao said 'science had reached a stage where the late Jawaharlal Nehru wished'. Speaking about the problems facing Indian science and technology, he underlined the importance of a greater dialogue and cooperation between CSIR laboratories and universities. He also called for a greater liaison between science and industry. Stressing the need for production-oriented scientific research, Prof. Rao said that if science was to be purposeful, then it had to be production-oriented.

On the personnel side, he added that the era of science would really start when scientists would be much in demand by industrial organizations. He wished for camaraderie among scientists. The present context of rapid social and economic progress provided an opportunity for young scientists and it is for them to increase the element of job satisfaction at all levels. The dignity and scientific character of workers should be preserved.

Dr A. Lahiri, Director, Central Fuel Research Institute, Dhanbad proposed a vote of thanks.

CFTRI Annual Report : 1967

The Annual Report of the Central Food Technological Research Institute (CFTRI), Mysore for 1967 has been published. The 122-page (royal 8vo) report reveals that 71 research projects were investigated and 21 projects completed during the year. In the case of completed projects, a full account of the investigations right from their initiation to completion has been presented; whereas in the case of projects still under investigation, the progress during the year has been reported. The Institute laid emphasis on projects aimed at achieving quantitative as well as qualitative self-sufficiency in food supplies.

The report reveals that with regard to the production of protein isolate several technological changes and operational alterations were made as a result of which the process was placed on a much stronger techno-economic foundation. The plant set up at Bombay began production towards the end of 1967 and its present capacity is about 2 tonnes/day. A fluid milk preparation 'Lac-Tone' was developed and process details were worked out on a bench scale during the previous year. Based on this, a pilot plant to manufacture 500 litres of the product per year is to be set up at the Bangalore Dairy.

Work on the development of high protein foods, a project which continued to receive substantial financial support from the National Institutes of Health, USA, was intensified; some of the products developed include weaning foods, dehydrated and fluid protein beverages, high protein biscuits and candies.

Research on improving the milling technology of legumes (which account for about 15 per cent of the foodgrain production and are a major source of protein in India) has shown that the average milling out-turn could be raised by 10 per cent. Fabrication of specialized units designed for milling has been undertaken.

Egg washing techniques and coating formulations to increase storage life of fresh eggs at room temperature have been successfully demonstrated. A simple technique for dehydration and solvent extraction of silkworm pupae has provided an additional source of protein for poultry and cattle-feed. The know-how is being used on a commercial scale. Another important contribution of the Institute during the year was the development of a process for preparation of high quality oleoresins and extractives from spices, one of the major foreign exchange earners.

Among the other activities of the Institute, mention may be made of the holding of the International Symposium on Protein Foods and Concentrates (27 June to 4 July 1967) and two short-term courses in Analysis, Standardization and Quality Control in Food Processing Industries; and Infestation Control in Raw and Processed Foods.

As many as 56 research papers were published. Three patents were filed during the year. These related to the dehydration of green peas; production of amylase from fungi; and detoxification of aflatoxin in foodstuffs. Processes released for commercial exploitation included: (1) processing of silkworm pupae, (2) solvent extraction of silkworm pupae, (3) production of clarified liquid fruits by pectic enzyme treatment, (4) manufacture of fruit bars, and (5) manufacture of albumen flakes.

Studies on Mushrooms as New Sources of Protein Food

Edible fleshy fungi have great potentialities as a source of proteinaceous food. To meet the scarcity of nutritious foods, especially in over-populated areas, development of new sources of such protein foods, which can be produced economically on a large scale, would be advantageous. Considerable amount of work has been done on the cultivation of mushrooms like *Agarius bisporus*, *Volvaria volvacea* and *Cartinellus berkelyanus*. No other species of mushroom seems to have been cultivated on large scale.

Production of mycelium, a source of amino acids and B-vitamins, by submerged liquid culture is one of the most recent developments. It represents a revolutionary method of producing a nutritious food from waste organic materials.

Studies have been carried out at the Central Food Technological Research Institute, Mysore on the cultivation and submerged propagation of *Pleurotus flabellatus*, a species of mushroom which is liked a eaten by local people and which c be cultivated under a wide range climatic conditions. Processing the fruit body and mycelium has a been studied.

Among the different types spawns of *P. flabellatus* prepar paddy straw spawn gave the ma mum yield of mushrooms wh inoculated in the beds. The mus room has been grown successfully paddy straw beds with red gra Bengal gram or oat meal as a sou of nutrient. Inorganic source nitrogen like ammonium sulph did not have any favourable eff on the growth of this fung *P. flabellatus* has been found to gr well at room temperature (21-35° and at relative humidity of 67- per cent.

Fresh mushrooms have be processed for dehydration, freezi and canning.

Submerged propagation of t mycelium of *P. flabellatus* was carri out both in synthetic and orga media. Ammonium citrate w found to be a good source of nitrog along with glucose as a source carbohydrate in a synthetic mediu Phosphorus, potassium, magnesi and calcium have been found to essential for the normal growth the mycelium. Among the vari organic media tried, wheat b and oat meal gave maximum yi of dry matter per litre of medium.

In further experiments, tapio a cheap and at the same time r source of carbohydrates was used a medium supplemented w ammonium citrate as a source nitrogen. Tapioca medium supplemented, besides ammon citrate, with various organic sou of nitrogen among which ground and rice bran extracts gave the results.

Fresh mycelium has l processed for dehydration, free and canning.

Mrs Zakia Bano of the Insti who carried out the investig under the guidance of Dr H Srivastava, was awarded the P degree of the Mysore Universit her thesis entitled: Studies on m rooms with particular referen cultivation and submerged pro tion of *Pleurotus flabellatus*.

PADMA BHUSHAN AWARDS

Prof. Niharranjan Ray, Director, Indian Institute of Advanced Study, Simla and Chairman, Executive Council, INSDOC and PID, Dr A. Lahiri, Director, Central Fuel Research Institute, Dhanbad and Shri K. Sreenivasan, Director, South India Textile Research Association, Coimbatore are among the recipients of Padma Bhushan in the list of Republic Day awards announced on 26 Jan. 1969.

Prof. Niharranjan Ray

Born on 14 Jan. 1904 in Mymensingh (now in East Pakistan), Prof. Niharranjan Ray had his early education in Mymensingh and Sylhet. After a brilliant academic career in the Calcutta University where he obtained his M.A. degree in Ancient Indian History and Culture (1926), he proceeded to UK and Netherlands for higher education. He was awarded the degrees of Doctor of Letters and Doctor of Philosophy by the University of Leiden (Netherlands) in 1936 and the same year he obtained the Diploma in Library Science from the London University.

Prof. Ray has been recipient of numerous coveted prizes and medals of the Calcutta University. He was awarded many university prizes and gold medals, including the Griffith prize, the Premchand Roychand scholarship, the Mouat gold medal and the Sarojini gold medal. He was also the recipient of the first Tagore Memorial prize of the West Bengal Government.

Starting as a research fellow in Indian art and archaeology in 1927, Prof. Ray has had an active academic career for over four decades. He had been intimately associated with several universities at home and abroad. He has taught ancient Indian history, culture, and fine arts in the university of Calcutta, and lectured at many universities in India and abroad. At Kerala and Baroda universities he held the chair of Tagore Professorship. He has been a visiting professor at the Washington University, St Louis, Missouri and University of Washington, Seattle. He has also lectured as guest professor at a number of universities in USA, UK, Europe and South-East Asia.

Prof. Ray has held several important offices. He was the Chief Librarian, Calcutta University, Cultural and Educational Adviser to the Burmese Government, Unesco Consultant and the Ford Foundation Consultant.

Several learned bodies and professional societies have honoured Prof. Ray. He is Fellow of the Asiatic Society of Bengal, the British Library Association, the Royal Asiatic Society and the Royal Society of Arts, London and the International Association of Arts and Letters, Zurich. Prof. Ray was the President of the Indian History Congress in 1967-68.

Widely travelled in India and abroad, Prof. Ray is a scholar of varied interests. He is a member of the Sahitya Akademi, Lalit Kala Akademi and Sangeet Natak Akademi. He was also member of the Indian Council of Cultural Relations, the Central Advisory Boards of Archaeology, and Education.

South and South-East Asian history and culture, art and archaeology and Bengali language and literature are his major fields of interest in which he has specialized. A prolific writer, Prof. Ray has to his credit over a dozen publications which include *Brahmanical Gods in Burma*, *Sanskrit Buddhism in Burma*, *Theravada Buddhism in Burma*, *Maurya and Sunga Art*, *An Artist in Life* (a commentary on the life and work of Rabindranath Tagore) and the *Medieval Factor in Indian History*. Presently he is engaged in writing books on Indian sculpture, Indian painting, Indian nationalism, Indian art and Indian history.

Dr A. Lahiri

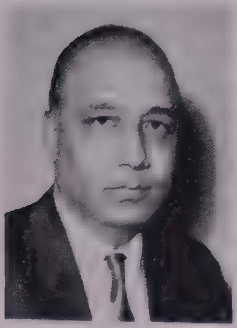
Dr Adinath Lahiri had a brilliant academic career in the Calcutta University. He proceeded to UK on a fellowship and did research work in geochemistry under Prof. H. H. Read in the Royal School of Mines, London leading to the Ph.D. degree of the London University in 1941. Later he obtained his D.I.C. He worked in UK for sometime under some distinguished scientists including Fellows of the Royal Society. In 1945 he was appointed Assistant Director (Planning) in CSIR for establishing the Central Fuel Research Institute (CFRI). In 1953 he was promoted as Deputy Director and in 1954 he took over as Director, CFRI.

Dr Lahiri has pioneered extensive fuel research in India and his work in this field is internationally recognized. His studies on physical and chemical structure of coals and their behaviour on pyrolysis led to concepts of petrographic preparation and blending of non-standard coals for coking, which have opened out vast reserves of hitherto unused coal. He has made major contributions to the techniques of coal beneficiation. In the field of advanced techniques of coal gasification, the industrial investigations carried out contribute outstandingly to better utilization of Indian coals.

Dr Lahiri has developed a new technique for converting noncoking coal into 'synthetic coke' and has operated the process successfully on a pilot plant scale. He is now on a project of converting high-sulphur coals of Assam to oil and chemicals, recovering sulphur as a byproduct. He has evolved industrial techniques for manufacture of smokeless domestic fuels from low-grade coking and noncoking coals with or without recovery of byproducts. The production of smokeless fuels on a commercial scale at Neyveli and the semi-commercial units at Hyderabad (based on CFRI process) speak of his efforts. Apart from work on methods of gasification of coals for production of synthesis gas for ammonia and town gas, he and his colleagues have succeeded in fixing nitrogen in coal, converting it into a slow-acting fertilizer and soil conditioner which has aroused interest.

Dr Lahiri is connected with the National Coal Development Corporation; is chairman, Solid Fuels Sectional Committee (ISI) and had been Adviser to the Durgapur Projects Ltd. He is fellow of many learned societies of UK and India—like the Institute of Fuel, Institute of Petroleum, and Royal Institute of Chemistry and of the National Institute of Sciences of India and the Institute of Engineers (India). He was awarded the K. G. Naik gold medal (1968) for his contributions to industrial research. Dr Lahiri has to his credit numerous research papers and patents (some already on commercial application). And has widely travelled in the East, West and on the continent on scientific missions.

Shri K. Sreenivasan



Shri Kasturiswami Sreenivasan received his education in the Madras and Manchester universities. On his return to India he was appointed as Manager and Director of one of the spinning mills in Coimbatore. He was elected Hony Secretary of the Southern India Millowners' Association and was President of the Textile Association (India) for the years 1959 to 1962.

Shri Sreenivasan has been mainly responsible for the setting up of the South India Textile Research Association. Under his dynamic leadership, the membership of SITRA has increased twofold since its inception in 1956. SITRA's contribution in the field of fundamental and applied research is widely recognized. Under his guidance the Association has been able to render valuable service to member mills. For instance, the labour productivity in the member mills of SITRA has increased by over 40 per cent during the past ten years and a number of useful testing instruments have been fabricated by SITRA.

Shri Sreenivasan has devoted personal attention to the study of a number of problems faced by the cotton textile industry from time to time, such as modernization, research and future prospects of the cotton spinning industry. He has also been directly associated with the improvement in the design and development of super high draft ring frame which received the Inventions Promotion Board's award. He was awarded the Fellowship of the Textile Institute (FTI), Manchester in 1961 for his contributions to the advancement of knowledge in the textile industry.

During the last twenty years, he has served the textile industry in various capacities. He is a member of the board of directors of a number of textile mills, textile machinery manufacturers and engineering companies. He was connected with various committees constituted by both State and Central Governments, as member and chairman including the Working Group on Modernization, the Textiles Committee, the Cotton Advisory Committee, etc. He was the chairman of the Study Group on Cotton Textiles set up by the National Commission on Labour, Government of India. He was a member of the Board of Scientific & Industrial Research and the Joint Standing Committee for Scientific Research and Industry of CSIR. He visited Japan in 1956 as a Member of the Indian Productivity Delegation on whose recommendation the National Productivity Council was set up. He has also visited many research centres and machinery manufacturers in Europe and the United States. Recently he visited USSR as Leader of the Indian Textile Scientists Delegation under the Indo-Soviet Cultural Exchange Programme.

In view of his wide interest and knowledge of the problems of industry and management he has been appointed as a Director of the Bokaro Steel Ltd. He also served on the Central Board of the Reserve Bank of India as a Director during 1964-68.

Besides a large number of research papers on the textile industry and on management problems, he has published a book entitled 'Productivity & Social Environment' which was awarded a prize by the Delhi Management Association under the 'Escorts Award for Book Competition 1966-67'.

Shri Bose appointed Chief Curator, CSIR Museums

Shri Amalendu Bose, Officer-in-charge, Visvesvaraya Industrial & Technological Museum (VITM), Bangalore has been appointed Chief Curator, Industrial and Technological Museums with effect from 20 Jan. 1969. His headquarters for the present will be at VITM, Bangalore.

Shri Bose (*b*. 1919, Calcutta) had his education at the Calcutta University. Securing first place in M.Sc. (chemistry) in 1940 and the university medal, Shri Bose started his research career in the laboratory of the late Prof. P. C. Mitter and worked on the synthesis of long chain fatty acids. Proceeding to USA on a Government of India scholarship, he took his M.S. in 1949 from the Polytechnic Institute of Brooklyn, New York. He started his career at the Patents Office, Calcutta where he rose to the position of Officer-in-charge. He joined CSIR in Nov. 1956 as Planning Officer, BITM, Calcutta. Under a Unesco fellowship he took training at the Science Museum, London and the Deutsches Museum, Munich.

In 1964 Shri Bose was entrusted with the task of planning VITM.

Shri Bose visited important museums in West Germany in 1962. He participated in the Pacific Science Congress (Tokyo, 1966), and in the meeting of the International Council of Museums in Cologne and Munich in 1968. He is a member of the Central Advisory Board on Museums. He is Vice-President of the International Committee for Museums of Science and Technology of the International Council of Museums, Paris. He has to his credit a number of research papers in organic chemistry and articles on different aspects of museum technology.

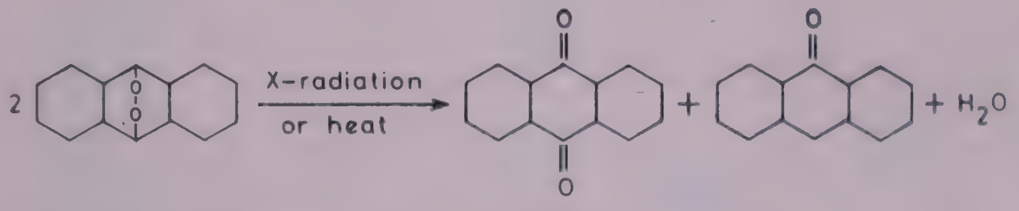
PROF. LONSDALE DELIVERS KRISHNAN MEMORIAL LECTURE

The National Physical Laboratory (NPL), New Delhi instituted the Krishnan Memorial Lecture five years ago to honour the memory of its first Director, Dr K. S. Krishnan, FRS. The fifth in the series was delivered by Prof. Dame Kathleen Lonsdale, FRS, Professor of Chemistry and Head of the Department of Crystallography, University College, London at NPL on 10 Jan. 1969. Choosing for her lecture the topic, Some current crystallographic research problems, Prof. Lonsdale gave an account of the solid-state transformations and the exact geometrical relationships in certain directions between the original and the newly growing crystals as a result of ultraviolet, or X-irradiation, heat, pressure or other agencies. If the change-initiating process was kept sufficiently slow, the whole crystal transformed into the new phase, without any change in the external shape or volume in spite of density differences between the two phases. She described the X-ray work on synthetic diamonds carried out in her laboratory and showed by slides the relationship of the hexagonal diamond to the cubic diamond form. This new form of diamond discovered by her is present in small amounts in the cubic diamond, formed on shock-compressing graphite at a suitable temperature. The normal product of high pressure (*c.* 50 kilobars), high temperature (above 1700°C) transformation of graphite in the presence of catalysts such as nickel is the cubic diamond. However if the pressure is substantially increased, a very small amount of the hexagonal diamond is also produced. This phase has also been detected in some meteorites, formed as a result of the tremendous pressures generated on impact, and has been named Lonsdalite after her. Her work has shown that the hexagonal diamond has an exact epitaxial relationship with graphite (the matching of the dimensions and directions of the axes in the hexagonal basal plane of graphite to the prism face of hexagonal diamond) and that the compression has to be applied in a suitable direction to a single crystal of graphite in order to transform it to the hexagonal diamond.

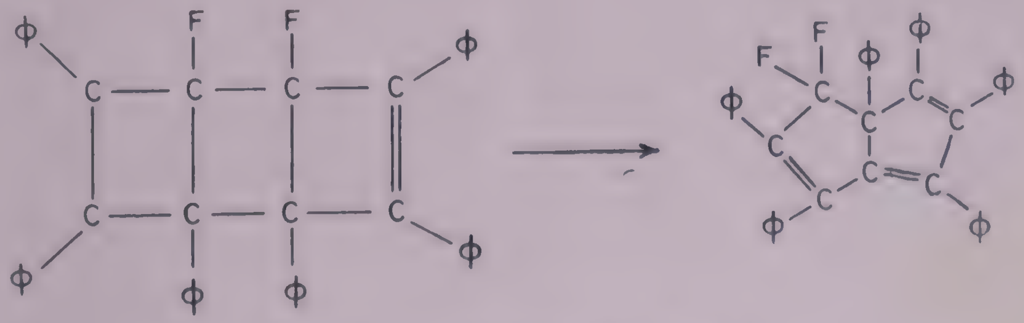
In some other interesting cases, illustrated by her, the chemical reaction proceeds through intermediate stages of disorder, decomposition and recrystallization which could be followed in detail by X-ray diffraction techniques because of the slowness of the reaction. The transformation of the photo-oxide of anthracene to a mixed crystal of anthraquinone and anthrone on X-irradiation was described in great detail in this context (Scheme I). The water molecules formed as a result of the process remained inside the crystal in the sub-microscopic cracks and voids.

The projection slides of the X-ray photographs showed the exact alignment of the two phases along the *b*-axis, the intensities of the original spots fading away with a corresponding increase in those of the new spots till the whole crystal had changed into a mixed crystal of anthraquinone and anthrone after about 300 hr of X-irradiation at room temperature. A crystal of the photo-oxide, kept at about 80°C and irradiated, changed to an intact, single crystal of anthraquinone-anthrone in about 7 hr but crumbled to a powder if the heating was done above 100°C. A single crystal of the photo-oxide exploded when placed on a metal plate heated to about 160°C. The isomerization $[\phi_3FC_4]_2$ was specially interesting as it involved the rearrangement as in Scheme II. The photo-dimerization of solid anthracene was also very interesting, brought about by the ultraviolet irradiation of a single crystal only if wavelengths shorter than 3000Å had been filtered out from the incident beam.

Prof. Lonsdale demonstrating the ordering of linear regions of anthraquinone-anthrone in the parent crystal of anthracene photo-oxide



Scheme I — Transformation of photo-oxide of anthracene to a mixed crystal of anthraquinone and anthrone



Scheme II — Isomerization of $[\phi_3FC_4]_2$

SPONSORED RESEARCH

Completed Scheme

Correlation of Structural Features with Spectral Characteristics and Pharmacological Activities in Certain Dyes and Drugs

Under a CSIR sponsored scheme at the Department of Chemistry, Ravenshaw College, Cuttack a number of *p*-dialkylamino styryl dyes and merocyanines have been synthesized with a view to studying the effect of structural changes on their absorption spectra and photographic sensitization. The dyes synthesized included: (1) *p*-dialkylamino styryl dyes and their aza and diaza analogues, (2) merocyanines, (3) azamerocyanines, (4) cyanines and their aza analogues, and (5) phosphocyanines and merophosphinines.

The hypsochromic or bathochromic effects observed as a result of incorporation of one or more nitrogen atoms in the chromophoric chain of different categories of dyes were found to be consistent with the conclusions based on the application of free electron model or molecular orbital method. The absorption data of styryl dyes and their aza and diaza analogues are consistent with Forster's rule.

The relative acidities of ketomethylene compounds and basicities of 2-methyl quaternary salts have been evaluated from the deviation of absorption maxima data using Brooker's deviation factor. The ketomethylene compounds have been listed in increasing order of acidity as: thiazolone, oxazolone, thiobarbituric acid and coumarins, pyrazolone, rhodanine, thiohydanatoin. The 2-methyl quaternary salts have been listed in increasing order of their basicities as: α-picoline, quinoline-4, quinoline-2, 4,5-diphenylthiazole, 4-phenylthiazole, benzothiazole, dibenzoxanthone.

The styryl dyes and cyaninies were found to be good photographic sensitizers sensitizing beyond the range of their absorption maxima. However, the dyes obtained by introducing nitrogen atoms in the chromophoric chain were desensitizers. The sensitization properties of the phosphorus containing polymethin dyes were also good.

The second part of the investigation consisted in the preparation and study of the pharmacological properties of some amino methyl derivatives and β-amino ketones from various heterocyclic nuclei like xanthone, pyridine, pyrimidine, coumarin, chromanone, thiachromanone and isocoumaranone.

Tests for antispasmodic and antihistaminic activities of typical compounds of each of the above series were made on strips of guinea-pig ileum using acelylcholine chloride and histamine acid phosphate respectively. The results show that the β-amino ketones derived from aminopyrimidine containing pyrazolone and thiobarbituric acid are more effective than those derived from rhodanine so far as antispasmodic activities are concerned. Amino methyl derivatives were also found to possess greater antihistaminic activities than similar derivatives obtained from rhodanine or thiobarbituric acid. Amino methyl derivatives showed feeble antihistaminic activities.

The amoebicidal properties of the typical compounds are under evalution at the Central Drug Research Institute, Lucknow.

The investigation was carried out by Shri Ashutosh Nayak, CSIR Research Fellow, under the guidance of Dr M. K. Raut, Department of Chemistry, Ravenshaw College, Cuttack from 14 March 1966 to 4 August 1968.

New Schemes

Study of Ionosphere by Radiowave Absorption Technique

A new scheme under the title 'Study of ionosphere by radiowave absorption technique' has been sanctioned by the Radio and Telecommunications Research Committee of CSIR at the Andhra University, Waltair. The investigator-in-charge is Dr K. V. V. Ramana of the Department of Physics.

Ionospheric absorption measurements are useful in deciding the power required for medium and shortwave broadcast stations from time to time. Absorption measurements of medium wave transmissions have been used in solar flare patrolling. In the new scheme it is intended to study the absorption in the frequency range, 2–3·5 MHz/s.

The study is expected to throw more light on the relative contributions of the lower and higher regions in the ionosphere to the integrated absorption in the path as also establish more clearly the absorption versus frequency law. If the absorption were to take place essentially in the lower regions, then an inverse square law relationship between the absorption and the operating frequency can be expected. Another aspect of the investigation is to study the variation of absorption with constant solar zenith distance at a particular operating frequency. As this absorption should remain constant from theoretical considerations any departure from the constancy will be useful in studying the influence of sunspots, magnetic and ionospheric storms, etc.

Ionospheric Wind Drifts at the Latitude of Madras

This new scheme has been sanctioned at the Madras Institute of Technology (MIT), Madras by the Radio and Telecommunications Research Committee of CSIR. The investigator-in-charge is Dr R. Sethuraman of the Faculty of Electronics Engineering. Construction work has started and regular observations are expected to be made in March-April 1969.

The object of the scheme is to study the wind like drift at ionospheric heights by the spaced receiver (Mitra's) method. A pulse transmitter operating on a frequency of 2·6 MHz sends pulses of 50-100 μsec duration and peak hour of about 5 kW. The pulses are reflected by the ionosphere and are received by three dipole aerials placed at the corners of a right-angled triangle (EW-NS). The side of the triangle is equal to a wavelength.

Simultaneous observations of the drift will be made at a number of places at a fixed frequency (2·6 MHz). One of the stations is at Madras which is situated just outside the jet stream in the ionosphere.

The equipment consists of pulse transmitter at the desired frequency, one transmitting and three receiving antennae, placed suitably, and electronic switch which connects the output from the three antennae in succession to a receiver and a display unit which photographs the fading pattern.

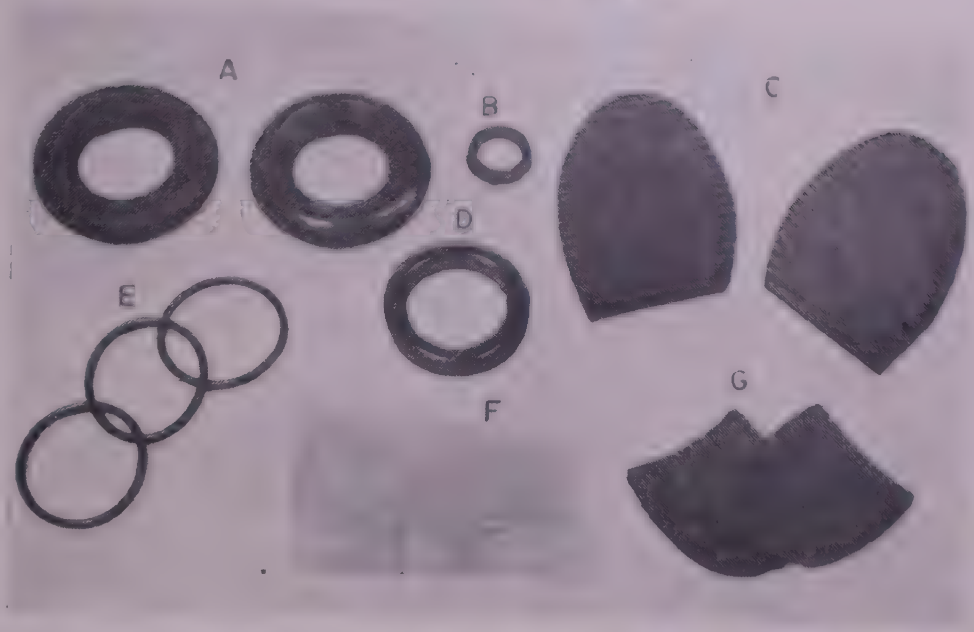
NCL develops Polyurethane-based Synthetic Polymers

Millable polyurethane elastomers are now commercially accepted by rubber industry. Polyurethane elastomers have outstanding properties such as high abrasion resistance, toughness, good ozone and oxygen resistance, aliphatic oil and solvent resistance.

Millable polyurethane elastomers from polyesters are now commercially available from many manufacturers of western countries. Details of their preparation are not available in the literature. Hence a systematic study of the chemistry and technology of millable polyurethane elastomers was undertaken at the National Chemical Laboratory (NCL), Poona.

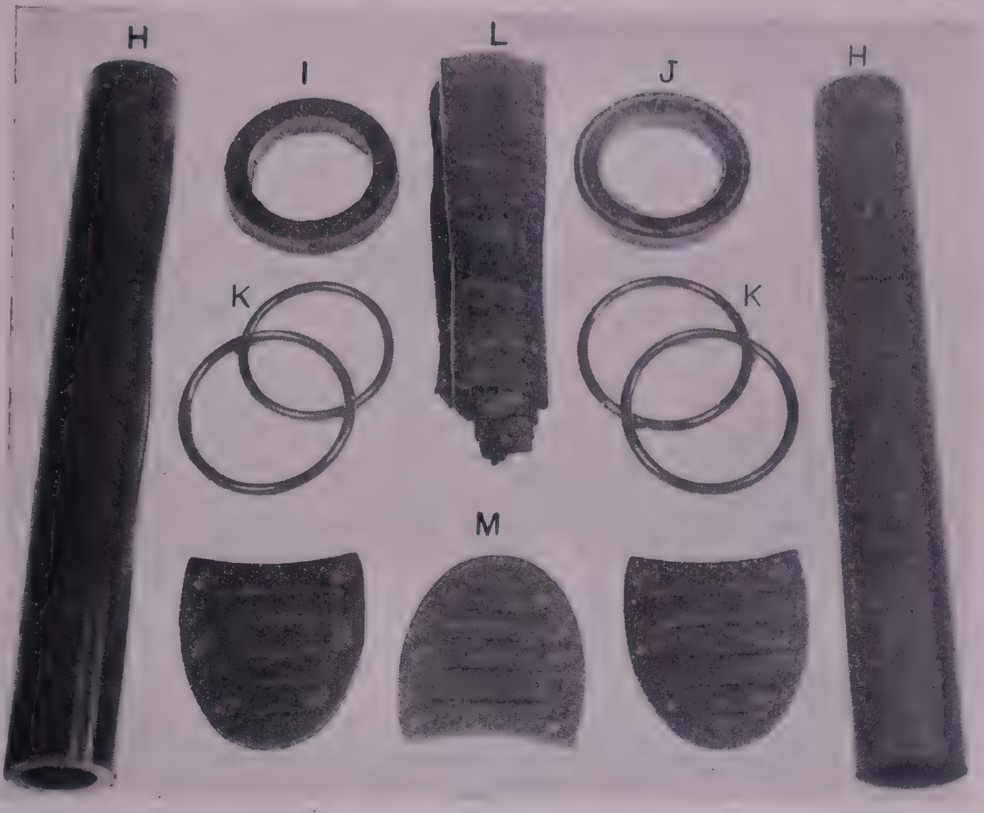
Polyesters were prepared using succinic acid, adipic acid, sebacic acid, hexadecamethylenedicarboxylic acid and a mixture of 80 per cent ethyleneglycol and 20 per cent 1, 2-propyleneglycol. Only the adipic acid ethylene-propylene glycol polyester when reacted with 4, 4′-diphenyl diisocyanate gave the elastomeric products. Polyurethanes produced from the polyesters of dibasic acid having lower or higher members in the adipic acid homologous series were found to impart leathery or plastic properties.

Different hydroxyl number polyesters were prepared from adipic acid, and 80 : 20 mixture of ethyleneglycol and 1, 2-propyleneglycol. The polyester was reacted with 4, 4′-diphenylmethane diisocyanate separately to produce millable polyurethane gums. They were processed by the usual rubber technological processes. When 1.0 equivalent of the polyester having 46 hydroxyl number was reacted with 1.2 equivalent of 4, 4′-diphenylmethane diisocyanate and 0.2 equivalent of methylenebis-(2-chloroaniline), a gum having comparatively better properties, was obtained. It was easy to process this gum on the rubber machineries. The elastomer could be cured with diisocyanate and peroxide curing systems. The physical properties of the resultant vulcanizates of the elastomer are comparable to those of the commercially available millable elastomers. The vulcanizate properties of elastomer P are as follows: tensile strength, 4000 psi; 300% modulus, 1600 psi; elongation, 550%; and hardness Shore A, 70.



Moulded products from elastomer P: A, trolly wheel; B, oil seal; C, shoe sole; D, hydraulic bucket; E, O-ring; F, elastomer P; G, shoe sole

Moulded products from difunctional castor oil based polyurethane rubber: H, typewriter roller; I, oil seal; J, hydraulic bucket; K, O-ring; L, lining materials; M, soles



Indigenous resources for the development of polyurethene elastomers have also been explored. Castor oil in India is cheaper than polyester. Castor oil (70% triricinoleate and 30% diricinoleate) was made difunctional by blocking one of three hydroxyl groups with phenyl isocyanate. The difunctional castor oil was reacted with 2, 4-toluene diisocyanate and 4, 4′-diphenylmethane diisocyanate separately to produce millable elastomers. These elastomers were processed using sulphur, diisocyanate, peroxide and radiation curing systems. When 1.0 equivalent of the difunctional castor oil was reacted with 3·0 equivalent of 4, 4'-diphenylmethane diisocyanate and 1·0 equivalent of ethyleneglycol, a millable elastomer having good physical properties was obtained. The properties of polyurethane rubber based on difunctional castor oil are as follows: tensile strength, 3500 psi; 100% modulus, 3500 psi; elongation, 100%; and hardness Shore A, 90.

Many moulded articles have been produced from these elastomers, such as typewriter roller, heels, soles, trolly wheels, O-rings, oil seals, hydraulic bucket, etc.

Shri Vasant Bhaskar Phadke, Scientist, NCL, Poona, who worked on this project under the guidance of Dr N. G. Ghatge, has been awarded the Ph.D. degree (1968) by the Poona University for his thesis entitled: Studies on polyurethane based synthetic polymers.

Determination of Moisture in Coke Samples

Investigations were undertaken at the Central Fuel Research Institute, Dh[illegible]bad to assess the correctness of the present IS method for the determination of moisture at 105-10°C at the request of the Indian Standards Institution.

Seven samples of varying moisture content (0·6-2·6%) were tested. The experiments were carried o[illegible] air oven at 110°, 150° and [illegible] and in a muffle furnace at 320°C. Moisture contents were noted when constant weights were obtained. A similar set of tests was carried out on the same samples in the Stanton type thermobalance. Using the same samples, a further set of tests was carried out in an inert (nitrogen) atmosphere.

Tests done in the thermobalance and air oven/muffle furnace gave more or less the same results. The moisture content determined in the inert atmosphere was consistently higher by 0·1 to 0·2 at any temperature level. No appreciable change in moisture was noticed between the tests carried out at 220° and 320°C, the difference being +0·1 only. However, a maximum difference (0·4) was observed between the tests done at 110° and 220°C.

The results suggest that it is sufficient if the moisture content of samples is determined at 220°C in ordinary atmosphere.

CSIR GOVERNING BODY RECONSTITUTED

The Governing Body of the Council of Scientific & Industrial Research has been reconstituted for a period of three years effective 1 April 1968.

Shrimati Indira Gandhi, Prime Minister is the President and the Union Minister of Education is the Vice-President. The members of the Governing Body are:

Deputy Prime Minister & Minister of Finance
New Delhi

*Union Minister of Industrial Development & Company Affairs
New Delhi

Dr B. D. Nag Chaudhuri
Member (Science)
Planning Commission, and Chairman of the Committee on Science & Technology
New Delhi

Dr D. S. Kothari
Chairman
University Grants Commission
New Delhi

Dr S. Bhagavantam
Scientific Adviser to the Minister of Defence
New Delhi

Shri K. K. Birla
15 India Exchange Palace
Calcutta

Dr Brahm Prakash
Director (Metallurgy Group)
Bhabha Atomic Research Centre
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Development Council on Machine Tools
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Shri P. A. Narielwala
Resident Director
Tata Industries (P) Ltd
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Maharashtra Small Scale Industries Development Corporation
Bombay

Dr M. D. Parekh
General Manager (Technical)
National Rayon Corporation
Bombay

Dr A. Ramachandran
Director
Indian Institute of Technology
Madras

Shri K. B. Rao
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Planning Commission
New Delhi

Dr A. K. Saha
Saha Institute of Nuclear Physics
Calcutta

Shri G. K. Singhania
J. K. Building
Kanpur

Director General
Council of Scientific & Industrial Research (ex officio)

Financial Adviser to CSIR
(ex officio)

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*Union Minister of Industry, Internal Trade and Company Affairs *since* 14 Feb. 1969

PATENTS

ACCEPTED

107347: *Improvements in and relating to the preparation of porous carbon electrodes from active carbons for use in air depolarized cells*, A. K. A. Waheed, C. Chakaravarthy, M. A. V. Devanathan & K.S.G. Doss—CECRI, Karaikudi.

SEALED

101924: *Improvements in or relating to anti-corrosion packaging*, K. S. Rajagopalan, N. Subramanyan & M. Sundaram—CECRI, Karaikudi.

101926: *Improvements in or relating to the manufacture of benzoyl chloride from benzotrichloride*, I. K. Kacker, H. Dakshinamurty, G. S. Sidhu & S. I. Ahmed—RRL, Hyderabad.

101930: *Improvements in or relating to nickel electrodeposition*, B.A. Shenoi, R. Subramanian, C. Balasingh & V. Srinivasan—CECRI, Karaikudi.

102100: *Improvements in or relating to lacquers for corrosion prevention*, M. Sundaram, N. Subramanyan, K. S. Rajagopalan & K. S. G. Doss—CECRI, Karaikudi.

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CFTRI DEVELOPS LACTONE

Development of milk-like products from vegetable sources of protein, mainly oilseed proteins, to replace milk is an important research programme of the Central Food Technological Research Institute (CFTRI), Mysore. Over the past few years toned milk has become popular in India, especially in big cities where fresh milk is in short supply. The skim milk powder used for toning of milk is largely imported. The Institute's research has established that it is possible to replace skim milk powder in toning of milk with a blend of groundnut protein isolate, liquid glucose, minerals and vitamins. The resulting product called Lac-Tone is like toned milk in all respects.

Process

The steps involved in the manufacture of Lac-Tone are as follows. Edible groundnut flour (milled expeller cake from decuticled seed) is mixed with water, and the *p*H of the mixture is raised by adding a suitable alkali. It is stirred well and passed on to a centrifuge. The liquor is treated with hydrogen peroxide to eliminate any toxic factors in groundnut meal or protein. The excess of hydrogen peroxide is eliminated by the addition of a known quantity of the enzyme, catalase. Protein is precipitated from the liquor by acidification. Removal of the nutty flavour is achieved by injecting live steam. The volume is adjusted so that every 1000 litres of liquid contain 45 kg of protein. Then 50 kg of liquid glucose and the required quantity of minerals are added to the liquid and mixed well using high speed stirrer. The protein liquor is thus ready for toning of milk.

In the final phase, standardized fresh milk (fat, 4%) is drawn into the mixing unit and blended with protein liquor equivalent to the quantity of milk. Vitamin premix (1 kg/1000 kg of blended milk) is added to the blended milk and the mixing operation is done with high speed mixers. The blend is homogenized and pasteurized. Finally, after it has passed through the chilling unit, Lac-Tone is bottled.

Nutritive Value

Lac-Tone has the nourishing qualities of fresh milk and contains some additional quantities of vitamins. It is fortified with 10 vitamins so that it has the composition of fresh milk. Addition of vitamins has been so balanced that over-vitaminization is avoided. The efficiency ratio of the product—an indication of the protein quality—is 2.3 as compared with a value of 3.0 for skim milk powder.

Lac-Tone is a nutritious drink and could be used for making coffee, tea or other beverages; it could also be converted into good quality curd.

Extensive trials have demonstrated that the nutritive value of Lac-Tone, when given to children (5-12 age group), is as good as that of toned milk.

Composition

The composition (values in per cent) of Lac-Tone is as follows: total solids, 11.5; fat, 2.0; solids non-fat, 9.5; protein, 4.0; lactose, 2.5; and glucose and maltidextrin, 2.5 g. The vitamin composition of Lac-Tone is as follows: vitamin A, 150 IU; vitamin B, 16 IU; vitamin C, 3.0 mg; thiamine, 0.04 mg; riboflavin, 0.15 mg; pyridoxine, 0.025

Clarification of protein liquor

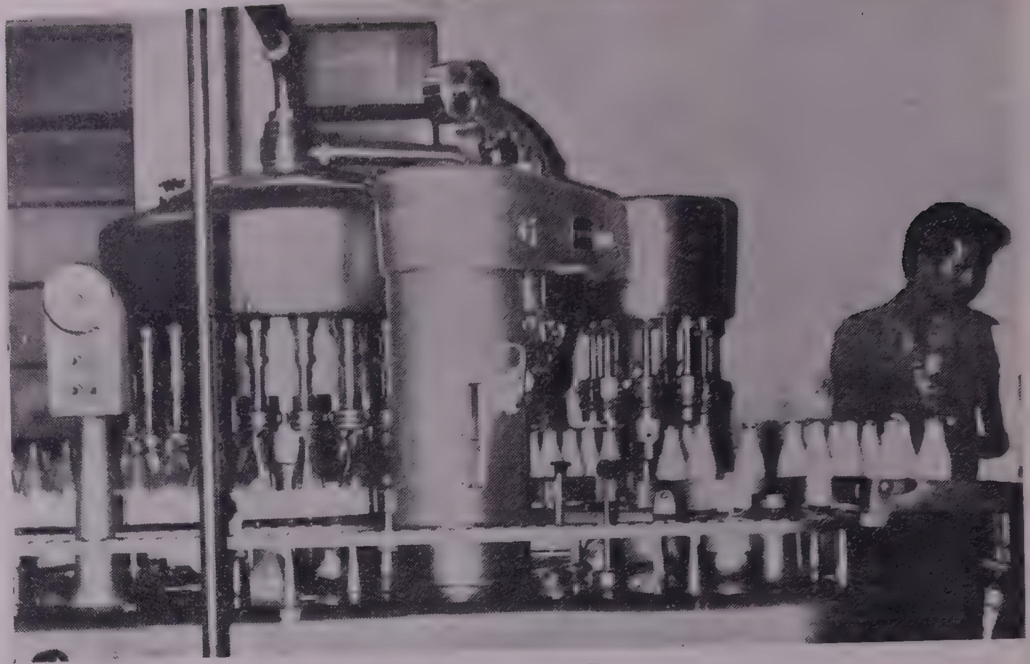
mg; niacinamide, 0.10 mg; calcium pantothenate, 0.35 mg and vitamin B_{12}, 0.27 mg.

For processing 10,000 litres of Lac-Tone per day, the equipment will cost about Rs 14 lakhs. The process for Lac-Tone manufacture is simple and involves only one or two special equipment, besides the equipment found in Indian dairies.

Advantages

The benefits of introducing Lac-Tone in the country would be threefold. First, there would be a substantial increase in the available milk supply. Secondly, there would be a substantial saving of foreign exchange resulting from the stoppage of imported skim milk powder which would have been otherwise required for toning milk. Thirdly, the cost of Lac-Tone would be less than that of milk toned with skim milk powder.

Trial production of Lac-Tone is being carried out at CFTRI and at the state-owned Bangalore Dairy. A plant (1000-litre/day) has been set up at Madhavaram Dairy, Madras where trial production will start shortly. A commercial plant for its production is to be set up in collaboration with UNICEF.



Bottling of Lac-Tone

CGCRI Annual Report: 1967

Self-reliance in essential glass and ceramic raw materials, products and processes, quality control, initiating manufacture of hitherto imported commodities and concentration on and priority to defence requirements are the highlights of the annual report (49-page) of the Central Glass & Ceramic Research Institute (CGCRI), Calcutta which has been published.

In the development of processes and products of strategic value notable items are: radiation shielding glass windows, infrared glass filters, synthetic quartz single crystals, glass-to-metal glass seals for electronic industry, high-temperature protective enamel for aero-engine parts, and enamel coatings for aluminium alloy aircraft parts.

Substitutes for scarce or imported raw materials have been developed. These include opacifiers from indigenous zircon sand, lead-boron-free earthenware glaze, zinc-free sanitaryware glaze and lead-free enamels for wire-wound resistors. And some important replacements for imported products evolved are: high alumina refractories, castable refractories and mortars, grinding wheels, standard strain discs, autoclave plaster of Paris, glass enamels and oil well cements.

Among the important new processes and products evolved as a result of sponsored research are: spark plug suppressor cap, ceramic seals and spacers, ceramic bulb-holders for aerodrome lights, silica candle filters for fertilizer plants, chlorination cells, porous cups for tensiometers and arc-resistant laminates.

Other researches conducted include: beneficiation studies on Jhansi diaspore, Salem magnesite and low-grade kyanite from Orissa, fixation of high level atomic waste in glass, chemical durability of glasses in the system Li_2O-B_2O_3-SiO_2, Na^+ ion electrode and metamict zircon.

Four processes developed at the Institute have been released for commercial utilization: (1) High-alumina refractories, (2) Autoclave plaster of Paris, (3) Metallization of non-conductors, and (4) Corrosion resistant cast iron enamels. Three processes are ready for commercial exploitation: (1) Improvement in the manufacture of fireclay refractories, (2) Low density insulating bricks from mica, (3) Chemical toughening of glass, and (4) Glass seals for lead-in electrodes.

Three patents have been filed and 47 research and review papers have been published.

Leather Week at Madras

An annual Tanners' Get-together was held at the Central Leather Research Institute campus, Madras during 31 Jan. to 8 Feb. 1969 synchronizing with the International Leather Fair. The get-together was sponsored jointly by the Leather Export Promotion Council (Madras), the Export Promotion Council for Finished Leather and Leather Manufactures (Kanpur), Indian Leather Fair Society (Madras), and the Central Small Industries Organization. About 400 foreign and Indian delegates participated in the get-together which was inaugurated by Dr Malcolm S. Adiseshiah, Deputy Director General, Unesco. The subject of the get-together, 'Dyeing and finishing of leathers' was discussed in five technical sessions: (i) impact of changing pattern of leather industry on national economy, (ii) dyes and dyeing, (iii) finishes and finishing methods, (iv) shoe finishes, polishes and dressings, and (v) CLRI research programme 1969-71.

The International Leather Fair held in CLRI grounds represented a cross-section of Indian and overseas leather and leather goods industries, leather auxiliaries and tanning machines. Forty exhibitors participated. The fair offered a chance to the tanners to compare notes on leather technology, trade and markets. A leather fashion parade was also held on 1 Feb. 1969.

EXPORT OF INDIAN LEATHER GOODS

CLRI Efforts

Indian leather exports in 1968 accounted for over Rs 750 million, and an export target of Rs 1250 million is envisaged at the end of the fourth five year plan. This could be achieved through diversification of exports from intermediate materials to finished products. Being one of the large export-oriented leather producing countries, India stands a good chance of becoming a major supplier of leather goods to the world market. The potential offered by western markets to Indian produce including footwear is considerable. The Central Leather Research Institute (CLRI) at Madras in association with the Leather Export Promotion Council and other allied organizations is making concerted efforts to develop new leather goods for export.

Problems of the Industry

Why is India today not in a position to boost its export of leather goods? The reasons are lack of : (i) right type of raw material, (ii) proper know-how and designs to meet the fast changing needs and fashions, (iii) suitable machinery and methodology for higher productivity, (iv) stringent standards, (v) promotional campaigns, and (vi) control on production cost. Most of the operations in use by the Indian leather goods industry are manual and are based on age-old techniques. The drawbacks of handmade leather goods are nonuniformity and clumsy workmanship. The industry also faces an acute shortage of certain special types of leather required for leather goods for export. The Indian industry faces hard competition from several countries which have already established themselves as exporters of leather goods.

Remedial Measures

The Leather Goods unit of CLRI which is engaged in the solutions of problems facing the indigenous leather goods industry, has evolved new materials which are available in varied hues and attractive finishes to suit the end product. These raw materials can be easily fabricated into finished goods by simple machines according to consumer requirement and at less cost. A major programme of the Institute is the production of specialty leathers for export such as dry cleanable clothing leather, sports goods leather, shark skin leather and shrunken grain upper, and split upholstery and lining leather. It has a regular programme of demonstrating the use of better production methods, materials and machinery; and provides facilities for laboratory testing and assessment at various stages.

New Designs

The Institute organizes each year a 'Leather Week' through which it projects some of the Indian skills and craftmanship and displays garments in dainty shades and attractive colours. Novel designs of fancy leather articles are also displayed. It has produced prototypes of new designs for the cottage as well as the medium and large scale units of the industry.

New designs of leather garments have been developed by the Institute and are in demand by foreign buyers. These have been taken up by industry for production. Attempts are being made to bring the manufacturers of garment leathers and makers of garments together to undertake commercial production of leather garments for export.

Leather goods developed by CLRI : garment, shawl, brief case and puppet

Market Surveys

Commodity surveys carried out by the Institute have revealed that leather goods which have a profitable export market include such conventional items as travel bags, vanity bags, brief cases, suitcases, watch straps, camera cases, wallets, etc. and specialty items like sports goods, leather garments, gloves and puppets.

Development Centre

The Institute has taken up the establishment of a leather goods development centre to tackle the problems of export promotion of leather goods. The activities of the centre would include: (i) testing and standardization of materials, (ii) improving quality control and productivity, (iii) designing and fabricating novel leather goods, (iv) disseminating technical information and know-how, (v) creating new markets, and (vi) training staff and artisans. The centre would assist the tanning industry in developing different types of leathers suitable for the manufacture of specialty leather goods and would help ancillary industries in the manufacture of components.

CMRS Investigates Subsidence in Coalmines

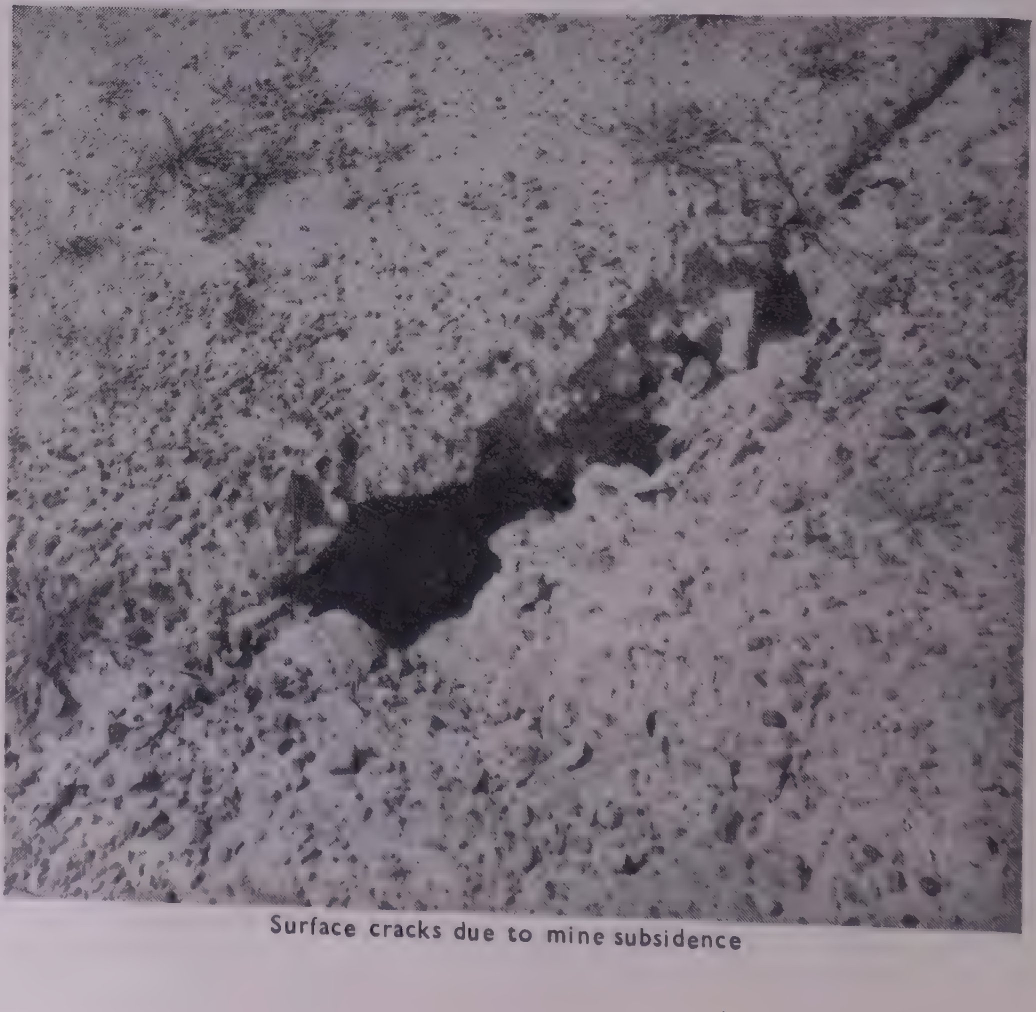
Mine subsidence is due to excavation of underground materials and results in heavy damage to the surface structures. The formation of cracks on the ground due to subsidence provides free access to air in the underground coal which often causes mine fires. In case the mining property lies below a river or water tank, the cracks may provide an inlet for the surface water causing inundation of the mine. To protect any surface structure from damage against subsidence the common practice is to leave coal pillars underground with an allowance of high safety factor. This practice results in loss of considerable quantities of minable coal. It would also be necessary to stow the excavated area. Hence, the study of mine subsidence has bearing on important aspects like planning of surface structures in mining areas, conservation of coal, protection of men working underground against fire or inundation, and economics of working a particular deposit. The Central Mining Research Station (CMRS), Dhanbad has been making investigations on mine subsidence in the Jharia, Raniganj and Karanpura coalfields.

Observations have been made with respect to long-wall, bord and pillar and partial extraction methods of coal winning. The investigations covered the following aspects: (i) relationship and extent of subsidence zones to mine workings and the amount of subsidence; (ii) amount of surface subsidence in relation to the thickness of the seam; (iii) area of the coal which could be extracted before any surface movement could be observed; (iv) distribution and magnitude of strains on the surface; (v) amount and direction of draw; and (vi) effect of surface movements with time.

The investigations have shown that the area on the surface subjected to these movements is more than the excavated area underground. The extent to which the movements affect is given by the relation $d \tan \alpha$, where d is the depth of the workings and α the angle of draw. The value of α as determined by CMRS observations varied between 13° and 18° depending upon the nature of rocks. It is therefore felt that for the protection of surface structures the sides of the coal pillars underground, in case of seams with moderate gradient, may be equal to the sides of the structures plus $2\, d \tan \alpha$ with some safety margin and that they should be on the same central line.

Under Indian conditions, the area of the panel is generally sub-critical, which does not allow the full subsidence of the surface area by working a single panel. Thus, while extracting the first panel, the subsidence effect on the surface would be very small, but with extraction of other panels and after sufficient lapse of time, large subsidence would be visible on the surface. The presence of barrier between two panels causes resistance to this movement, and therefore, in such cases the subsidence on the surface is not uniform. The irregular movements have greater damaging effects. Hence the formation of bigger panels is preferred.

In case of bord and pillar working, the leaving of small coal pillars (stooks) underground prevents surface movements; but in case they are not sufficiently strong and are irregular, sudden surface movements may occur and result in severe damages.



Surface cracks due to mine subsidence

SPONSORED RESEARCH

Completed Schemes

Study of Experimental Bone Grafts

The search for a satisfactory bone transplant substitute for the patient's own bone has created interest mainly in various types of preserved and treated homogeneous bone grafts. Recent work based on clinical observations suggests the cross-species (heterogeneous bone) transplants could serve a useful purpose. Bone grafting involves a 'biphasic system' in which the transplanted bone may theoretically survive to produce new bone or stimulate host tissue for osteogenesis; on the other hand the recipient site may accept the bone graft by invasion and replace it with new bone or reject it by the phenomenon of 'immune response' which tends to sequestration and subsequent failure of new bone formation. Under a CSIR scheme sponsored at the G.R. Medical College, Gwalior the biological differences associated with transplants of fresh autogeneous, homogeneous and heterogeneous bones have been compared using adult albino rats as experimental animals. A defect on the posteriolateral surface of femur was created, and the defect was grafted with a similar test piece of bone graft. The autogeneous and homogeneous grafts were obtained from iliac crest and the heterogeneous bone from guinea-pig. A similar defect created on the left femur acted as the control.

The animals which received autogeneous bone transplant were sacrificed at 1, 2 and 8 weeks and those which received homogeneous and heterogeneous bone transplants, at 2 and 8 weeks' interval. In the sacrificed animals, paraffin sections perpendicular to the long axis of bone defect were microphotographed, magnified and examined to distinguish the living from the dead bone.

Control bone defect showed proliferation of vascularized granulation tissue arising adjacent to the endosteal surface. During the first week the amount of gap filled up was not appreciable; in the second week there was the usual proliferation of endosteal ostioblast into the defect with deposition of new bone formation. At the eighth week the defect was partially filled up.

The bone defects which received fresh cancellous auto-, homo- and heterogeneous bone transplants healed in the same way. There was initial vascularization and the host tissue coped with the test transplant. New bone formation started near the margin of defect. Trebeculation anchored the transplant from periphery to the centre.

The control bone defects reconstituted more new bone formation at all levels of periods as compared to the autogeneous, homogeneous and heterogeneous bone grafting. The replacement of fresh cancellous autogeneous, homogeneous and heterogeneous bone was not apparent during the first eight weeks following transplantation. Heterogeneous bone replacement was slower.

New bone formation was most rapid in the early period following transplantation, then became nearly equal to homogeneous and heterogeneous bone grafting. After a long period the different transplants did not show significant difference.

The fact that heterogeneous bone transplants in no way differ from other types offers possibilities of their being used clinically as a substitute for dearly obtained autogeneous bone.

The work was carried out by Dr R. L. Gupta, CSIR senior research fellow, under the chief investigator, Prof. M. Kumar at the Department of Experimental Surgery, G.R. Medical College, Gwalior.

New Schemes

Sorption-Desorption Hysteresis

A study of 'Sorption-desorption hysteresis in high polymers' has commenced under a Retired Scientists scheme of CSIR at the Department of Inorganic and Physical Chemistry, Indian Institute of Science, Bangalore. The investigator is Dr K. Subba Rao.

Earlier investigations on nonrigid, swelling sorbents like proteins, starch, gum arabic with a solvating sorbate like water have shown a unique and interesting behaviour in successive sorptions and desorptions. The sorption-desorption hysteresis loop initially exhibits decreases in size in successive cycles and finally disappears. The disappearance of the hysteresis loop is a general phenomenon exhibited by all swelling sorbents and solvating sorbates, and has been explained on the basis of the cavity theory in conjunction with the properties of hydration and swelling of the sorbents. Before sorption, the cavities which are present in the sorbent are stable. They entrap water and cause hysteresis. On successive sorptions, the sorbent swells, becomes elastic, the cavity walls collapse, the cavity decreases in size and finally disappears thus accounting for the decrease in size and disappearance of the hysteresis loop.

The extent of swelling is dependent on the degree of inter- and intra-molecular cross-linking of the molecules of the nonrigid sorbent. Therefore, variation of the degree of cross-linking should bring about a corresponding variation in the hydration capacity of the sorbent and the tendency of the hysteresis loop to disappear. It is proposed to experimentally verify this phenomenon in the case of polystyrene.

Samples of polystyrene of different degree of cross-linking will be made by adding different amounts of the cross-linking agent, divinylbenzene to the monomer, styrene. With these samples, sorption and desorption of benzene will be studied employing the quartz fibre spring technique. The quartz fibre balance is being fabricated.

Thermodynamics of Binary Mixtures of Organic Compounds

Work on this new scheme has started in the Department of Chemistry, Indian Institute of Technology, Bombay under Dr D. D. Deshpande. Systematic determinations of several thermodynamic properties of binary liquid systems have been envisaged. Excess functions for a large number of solutions of associated compounds have been measured by earlier investigators. In the present programme the study of mixtures of simple molecules like aromatic, alicyclic and polycyclic hydrocarbons and molecules with very small dipole moments is contemplated.

The investigations will include studies on (1) excess volumes at 10-50°C; (2) heat capacities of solutions (C_p) at 10-50°C; (3) heats of mixing of liquids (using an improved adiabatic calorimeter) at 10-50°C; (4) vapour pressures of liquids and solutions (two units to be used—Prigogine type still and Swietoslawski type ebulliometer); (5) virial coefficients; (6) velocity of sound in various solutions at 10-50°C, from which it is possible to evaluate adiabatic compressibility, free volume and heat capacity at constant volume; and (7) gas-liquid chromatography of the systems.

Kinetics and Mechanisms of Reactions of Peroxides and Free Radicals with Metal Salts

This is a new CSIR scheme sanctioned at the Indian Institute of Technology, Kanpur. The investigator is Dr R. V. Subramanian of the Department of Chemistry.

The reactions of metal salts with peroxides, hydroperoxides and free radicals have been extensively applied in polymerization, autoxidation and organic syntheses. However, little is known about the mechanism of organic reactions effected by metal complexes. In view of this fact, the present study has been taken up as part of a broad programme of work aimed at elucidating the mechanisms of these reactions mainly by kinetic studies.

The investigation is centred on peroxide decompositions in which the catalysis is achieved by the ability of the metal species to function as redox reagents, for example, the decomposition of aliphatic acyl peroxides by copper salts. It is known that the peroxide is reduced by cuprous ions present to generate free radicals and cupric ions. The alkyl-free radicals are then oxidized by the cupric salt with the formation of cuprous ions which can then regenerate the catalytic decomposition cycle. The oxidation of the alkyl radicals can proceed either by ligand transfer or electron transfer mechanism, depending on the structure of the radical and nature of the copper salt.

Under this scheme it is proposed to carry out a detailed investigation of the catalytic peroxide decomposition to find evidence in the overall kinetics for the mechanism of the reaction. Catalysis by some other metal salts in addition to copper will be undertaken. The key step in the catalysis is the oxidation of the radical by the metal. By evaluating rate constants for this important reaction, ligand transfer oxidation and electron transfer oxidation will be studied in comparison with each other and in competition with other free radical reactions like hydrogen atom abstraction. A point of great interest and importance is the change effected in the reactivity of the metal by modifying the environment around the metal nucleus using complexing agents. The dependence of the reactivity of the free radical on its chemical structure is another. The current studies are directed towards adding new knowledge on these important aspects of reaction mechanism.

PROCESSES FOR GLASS-TO-METAL SEALS AND ELECTROLYTIC SODIUM READY FOR COMMERCIAL UTILIZATION

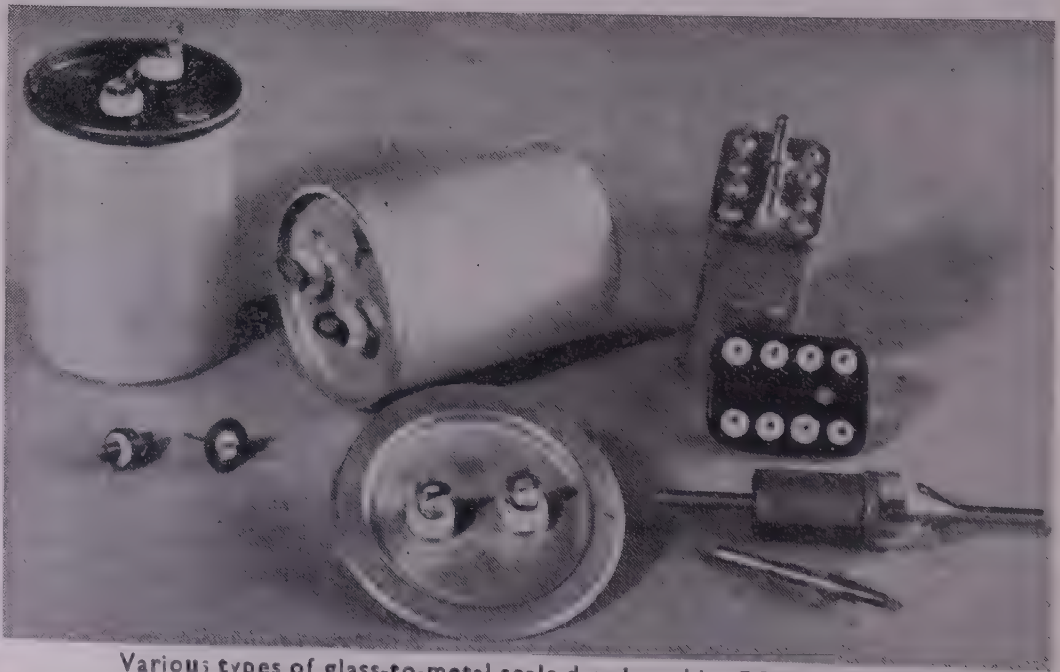
Glass-to-Metal Seals

Glass-to-metal seals of different types are extensively used in a wide variety of electrical devices and electronic elements. They are generally employed where lead-in electrodes are to be introduced in hermetically sealed unit, such as discharge tubes, transistor headers, electronic relays, compressor units, etc. The know-how for various types of seals as well as the glass compositions to be used for the purpose has been developed by the Central Glass & Ceramic Research Institute (CGCRI), Calcutta. Investigations at the Institute have also shown that these glass-metal seals could be suitably designed for specific uses and would be not only cheaper but better substitutes for metallized ceramic bushings which are used in very large numbers in oil-filled condensers and small transformers.

The materials required for making these seals are: (i) sealing glasses, which CGCRI can supply until such time as they are produced by a commercial firm, (ii) lead-in metal electrode (usually copper); electrodes made out of special metal alloys are also used in less common items and are to be supplied by consumers; and (iii) metal base, usually fabricated by punching low carbon steel.

The process of making the seals consists in 'preparing' the surface of the metallic components; sealing the lead-in electrode and the metal base with fused glass; and metallizing the assembly.

The process is simple and does not call for large capital outlay on imported equipment. Economics of



Various types of glass-to-metal seals developed by CGCRI, Calcutta roduction of one type of electrode sembly which goes with oil-filled apacitors used in electric fans, have een worked out on the basis of the utput of a local firm which produces 000 such capacitors per day. The stimated cost is about 20 paise/ iece compared to the reported cost f about 45 paise when ceramic ushings are used.

Electrolytic cell (1600 amp) for the production of sodium metal designed and fabricated by CECRI, Karaikudi

Production of Sodium Metal

Sodium metal is chiefly used in the manufacture of tetraethyl lead and tetramethyl lead. It is also used in the preparation of sodium peroxide, sodium cyanide, drugs & pharmaceuticals, high molecular weight alcohols and in the production of metals like thorium, zirconium, uranium and titanium. It is also used as coolant in atomic reactors. Polythene clad sodium cable is reported to be in use in USA under the trade name Nacon, which has replaced copper cables.

At present there is no production of sodium metal in the country although all the raw materials needed for its manufacture are available indigenously. The entire requirement of the country is met by import. The import statistics of the metal as available do not give a clear picture of the demand for the metal in the country. Indian Drugs & Pharmaceuticals Ltd alone require 250 tons of sodium metal per annum. It is estimated that the potential demand for sodium metal may be of the order of 2500-3000 tons. The country also imports considerable quantities of finished products in whose manufacture sodium is used as a raw material.

The know-how for the production of sodium metal has been worked out at the Central Electrochemical Research Institute (CECRI), Karaikudi and a 2500 amp cell has been designed, fabricated and operated successfully. The process consists in electrolyzing mixtures of barium chloride, calcium chloride and sodium chloride in an improved Downs cell. Optimum conditions have been worked out for obtaining sodium metal at an average current efficiency of 60-65 per cent and the energy requirement was 18 kWh/kg.

The process has been studied on a cell of 2500 amp capable of giving 32 kg of metal per day. A 1650 amp cell has been continuously run for as long a period as 102 days and over 1062 kg of the metal has been produced in a single run.

Pure sodium chloride, anhydrous calcium chloride, anhydrous barium chloride, some high speed diesel oil and ammonium chloride are the main raw materials required. All are available indigenously.

The items of plant and machinery required are: silicon rectifier; high amperage low voltage step down transformer; blower and compressor; cells with refractory lining, graphite anode and cast steel cathode; and oxygen, nitrogen and acetylene cylinders.

The total capital outlay for a plant of capacity 32 kg/day is estimated at Rs 1.7 lakhs, and the cost of production works out to Rs 13.20 per kg.

The product prepared at the Institute has been found to satisfy the specifications for the metal required in the manufacture of drugs, alkaloids, etc.

Parties interested in taking up the commercial utilization of the processes are invited to contact the Secretary, National Research Development Corporation of India Ltd, Mandi House, Lytton Road, New Delhi 1.

Chemistry of Osones

The chemistry of osones has been studied by Shri J. Meena Rao of the Central Food Technological Research Institute (CFTRI), Mysore under the guidance of Dr M. Srinivasan. The award of Ph.D. degree to Shri Rao by the Andhra University for his thesis on the subject has been announced (*CSIR News*, Vol. 18, p. 100).

With a view to understanding the mechanism of the beneficial effects of proteins on blood sugar levels, the mode of action of insulin in respect of glucose uptake and related compounds like osones has been studied. It became necessary during the course of the investigation to prepare osones and consider their structure and inter-related sugar osazones.

Splitting osazones to form osones is one of the standard methods of preparation. Furfuraldehyde, for instance, is a facile agent to split osazones to osones. Another standard method of preparation is by direct oxidation of sugars.

Osones were characterized by their ready formation of osazones in the cold when treated with phenylhydrazine. Tri-O-isopropylidene derivative of glucosone were prepared and were characterized through their 2,4-dinitrophenyl-osazones (DNPOs). Their reaction with 2,4-DNPH could also be used for their gravimetric estimation.

Knowledge of the structure of osones is intimately connected with that of osazones, as they are mutually interconvertible. The DNPOs prepared for the purpose of comparison were subjected to NMR and IR spectral studies. Spectral evidence showed that the rate of mutarotation in these compounds was slow and indicated a structural similarity to unsubstituted sugar osazones. Rhamnosazone and DNPO-L-rhamnose were found to mutarotate with greater facility than their glucose counterparts although terminal hydroxyl is lacking in rhamnose. However, NMR data revealed that the chelation of imino proton was similar to other osazones. The importance attached to C-3 hydroxyl in governing chelation in sugar osazone and in mutarotation could not be brought out clearly in results with 3-O-methylglucosazone.

Both these aspects were brought out better with ascorbic acid osazones (AAO). Through NMR and IR spectral studies of AAO in DMSO, it was found that the two imino protons therein were both bonded as contrasted with only one in sugar osazones. Unlike in sugar osazones, there was evidence for an intact lactone ring in AAO. Based on these data, a quasi-aromatic chelate structure for AAO has been proposed. These data also suggest that AAO, in common with sugar osazones, mutarotates. This was confirmed by changes in optical rotation. The isomer formed after mutarotation could be worked up without reverting to the parent osazone, unlike in sugar osazone. The response of bonded imino proton in AAO isomer and sugar osazone to addition of NaOH differed, although in both these compounds chelation is of the same N—H—N type.

That DNPO derivative of ascorbic acid (DNPOAA) mutarotates but very slowly was evident from the NMR spectra. That similar changes in chelation as in AAO take place in DNPOAA also became evident from the IR spectra in DMSO parallel to those observed in NMR. The lactone in DNPOAA being intact was also indicated by periodic acid oxidation. Therefore, DNPOAA appeared similar to AAO structurally.

Shri M. M. Suri

Shri Man Mohan Suri relinquished Directorship of the Central Mechanical Engineering Research Institute, Durgapur effective 14 Dec. 1968 (*CSIR News*, Vol. 19, p. 17).

In June 1964, Shri Suri took over as Director of the Institute. Under his guidance the Institute has not only established itself as a leading mechanical engineering research institution in the country but has rendered yeoman service to the industry. The hundred per cent indigenous 20 hp tractor, practically the whole range of cable making machines which have brought the country to near self-reliance in this important industry, the 175 cc scooter and the 49 cc moped are among his many contributions. During his 4½ years' tenure as Director, the Institute has delivered to the industry a large number of technologies ranging from a comparator for measurement of 1/250 thousandth of an inch accuracy to the 100 ft long cable stranding machine. All these have contributed not a little to the indigenous production of hitherto imported machines. A ten-head loop paper insulating machine designed and fabricated under his guidance has received the highest award for import substitution from the Inventions Promotion Board.

Shri Suri is internationally known for his invention 'Suri Transmission' which revolutionized diesel locomotion engineering. Awarded Padma Shri in 1962, he was also recipient of the Shanti Swarup Bhatnagar Award the same year for outstanding contributions to engineering sciences. He was awarded Sir Walter Puckey Prize by the Institution of Production Engineers (UK) in 1965 for his contributions to production engineering.

Directory of Scientific Research Institutions in India

The Directory is being compiled and published by the Indian National Scientific Documentation Centre (Insdoc), New Delhi and is scheduled for release in April this year. It contains information on 600 scientific institutions in India engaged in research and developmental activities. It lists the names of the institutions, the names of directors and heads of divisions, the fields of research, etc., and contains analysis of resources and personnel engaged in scientific research according to the complex to which they belong, viz. CSIR, ICAR, ICMR, AEC, universities or government departments. It gives details of history, functions, achievements, publications, special facilities available, budget, staff and distribution of work.

The Directory should be invaluable to scientists, administrators, planners and international organizations.

Enquiries: Director, Insdoc, New Delhi 12.

INDIAN PLYWOOD INDUSTRIES RESEARCH ASSOCIATION

Applications are invited for the post of Director, Indian Plywood Industries Research Association, Bangalore. Pay scale Rs 1800–100–2000. Persons holding a doctor's degree in chemical engineering, chemistry or physics with research experience will be considered. Candidates should have established reputation as research workers.

For further particulars and application forms please apply enclosing self-addressed and stamped (15 paise) envelope to the President or Director, Indian Plywood Industries Research Association, Post Bag No. 3, Tumkur Road, Bangalore 22 before 15 April 1969.

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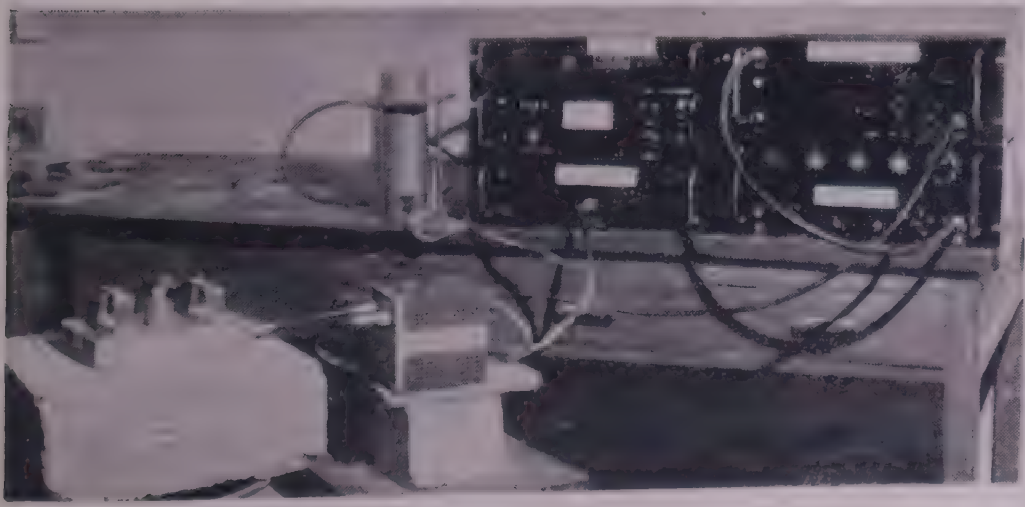
Estimation of Cement Content in Concrete : New Method evolved by CRRI

A method for estimating cement content in hardened concrete on the basis of the amount of hydrogen nuclei present in the concrete has been developed by the Central Road Research Institute (CRRI), New Delhi. The extent to which fast scattering neutrons are converted into slow thermal neutrons by the hydrogen nuclei present in the concrete at different moisture levels, i.e. between completely saturated condition and an almost dry state, forms the basis for calculations. Studies have shown that the neutron count is directly proportional to the moisture content. Knowing the minimum quantity of water required for complete hydration of cement, the quantity of cement present in the sample can be estimated. On an average, the minimum quantity of water for complete hydration of medium, fine and ordinary portland cement is 15-18 per cent by weight. Since it is contemplated to use the method for hardened concrete of not less than 4 weeks in age, it has been assumed that major part of hydration will have taken place by that time.

The nuclear moisture gauge developed by CRRI has an effective zone of 15 cm radius and 10 cm depth and consists of a source of ^{227}Ac-Be of 10 mC strength and a pair of BF_3 slow neutron detectors. Stabilized high voltage is fed to the counters and the output of the probe connected in series to head amplifier, non-overload amplifier and decade scalar unit. A preset timer is coupled to the scaling unit to obtain the counts per unit time.

The method is quick and its reproducibility is satisfactory. While it may take at least 7 days to determine cement content through chemical analysis, the nuclear probe can estimate the cement content in as many as 5 samples within 48 hr. As only a very small quantity (1 g) of ground mortar is used in the chemical method of analysis, the error will be large and reproducibility low, unless sufficient number of samples are analysed. On the other hand, fairly heavy chunks (up to 15 cm × 15 cm × 10 cm) of concrete blocks can be tested as such for cement content by the nuclear method. The errors occurring in the nuclear method are due to: (1) the assumption that 15-18 per cent (by weight) of water is consumed by the cement as a result of hydration; (2) the presence of slight moisture in the free fine pores that cannot be removed through oven-drying; and (3) delayed hydration due to the effect of higher temperature during drying. The error obtained for the cement content by the proposed method is ±10 per cent, whereas the error due to chemical method may be of the order of ± 20 per cent.



A concrete sample being tested for its cement content by the nuclear method, developed by CRRI, New Delhi

CFTRI develops Nutritious Infant Food

A process for preparing a nutritious baby food from buffalo milk, with a protein content lower than that of commonly used milk foods but sufficient for infant nutrition, has been standardized by the Central Food Technological Research Institute (CFTRI), Mysore.

The composition of the milk food has been adjusted so that it conforms to that of human milk which is universally regarded as the ideal food for the nutrition of babies. This food is therefore as nutritious as human milk although it contains only about 12 per cent protein as against 22 per cent protein prescribed by the ISI standard. Adequacy of the lower protein content for promoting normal growth has been established by feeding trials on laboratory animals. The food is enriched with methionine, one of the essential amino acids, so as to raise the biological value of its proteins to that of human milk protein. The product, used on a commercial scale, could replace full cream milk powder for [illegible]ing babies.

The quantity of milk required for preparing this baby food with reduced protein would be much less than that needed for common milk foods. Only about 3 kg of buffalo milk would be sufficient for preparing

1 kg of this food, whereas for preparing 1 kg of infant milk food conforming to ISI standard, the requirement of milk would be about 5.5 kg.

It is envisaged that commercial adoption of the process standardized by CFTRI would almost double the output of infant food from the same quantity of buffalo milk without appreciable increase in cost.

Methanometer designed by CMRS

A bench model methanometer has been developed and fabricated by the Central Mining Research Station (CMRS), Dhanbad. The instrument indicates the presence of methane within 5 sec. The accuracy of the instrument is 0·02 per cent in the lower range (0 to 1%) and 0·1 per cent in the higher range (0 to 5%).

Methane can be burnt at its ignition temperature or may be safely oxidized at lower temperatures by means of a catalyst. Noble metals like rhodium, palladium, platinum and some metal oxides like Co_3O_4, Cr_4O_3 and CuO and their combinations have been found to oxidize methane much below its ignition temperature. The catalyst employed in this instrument is a noble metal mounted on activated alumina. The oxidation of methane is carried out in flow conditions in a light metal chamber. The instrument works on 4-4·5 V dc. The unbalanced current produced by the combustion of methane on the catalyst surface bears a linear relation to the percentage of methane in the sample, and makes it convenient to calibrate the scale of a low resistance milliammeter.

Bench model methanometer developed by CMRS, Dhanbad

All the parts are all indigenously manufactured. Some ten instruments have been assembled in the laboratory on an experimental scale. Six instruments have been supplied to industry for field trials.

The performance of the methanometer has been reported as highly satisfactory and useful for quick detection of inflammable methane in coal mine air samples.

SERC Annual Report: 1967-68

The annual report of the Structural Engineering Research Centre (SERC), Roorkee for the year 1967-68 records the large-scale adoption of hot-rolled and cold-worked deformed bars developed in its laboratories as substitutes for mild steel in concrete reinforcement as its major achievement. A handbook on reinforced concrete dealing with the working stress method was published.

A plane torsion-free profile has been developed for northlight shell roofs with the centre of gravity and shear centre nearly on the same vertical line. A comprehensive testing programme on the mechanical properties of deformed bars and the behaviour of structural members reinforced with them has been taken in hand. The method of twin cantilevers, developed earlier for the analysis of shear walls, has been extended to include the effect of shear deformation in walls and interconnected shear walls. Work has been completed on the standardization of precast, prestressed bridge girders in the span range 7·5-36 m. A method has been developed for the direct design of prestressed concrete sections in flexure.

Based on the plastic theory, portal sheds of spans ranging from 6 to 18 m in steps of 3 m have been standardized. Computer programmes were developed for the complete automatic design of transmission towers. Improved programmes were developed for the analysis of pin and rigid-jointed space frames. A programme for the analysis of grids has been written to accommodate as many as 200 joints utilizing orthogonal and circular symmetries that may be present in the structure.

A slope measuring device has been designed and fabricated; the device measures the tilt of power house floors over a long period of time (over 5 years). A simple and sensitive mechanical device capable of measuring slopes as small as 5 sec was designed for the purpose. A Moire' fringe apparatus for the analysis of plates and slabs was fabricated. A device has been designed for the direct measurement of pressures on grain storage silos.

Supplement to Glossary of Indian Medicinal Plants

Glossary of Indian Medicinal Plants published in 1956 by the Publications & Information Directorate, New Delhi gives a concise account of the distribution, important constituents, properties and uses of the medicinal plants. Over 2,600 species belonging to about 1,350 plant genera were dealt with. The information was given under the botanical names of the plants arranged alphabet-wise; trade and vernacular names were also mentioned. The volume contained two indices—vernacular and trade names, and chemical constituents.

The directorate has recently brought out a Supplement (authors: R. N. Chopra, I. C. Chopra & B. S. Varma) which brings the Glossary up to date. The Supplement follows the style of the Glossary and covers relevant information published during 1955-64. It provides additional information on 700 species mentioned earlier and includes 380 new species. Indices on additional vernacular and trade names and chemical constituents have been included. The Supplement will be useful to practitioners of indigenous system of medicine and those interested in drugs of vegetable origin.

VISITORS

Dr Tahar Turbadar, Professor of Optics, Chairman of the Physics Department and Dean of the Faculty of Sciences, Damascus University, Syria visited the Central Glass & Ceramic Research Institute (CGCRI), Calcutta on 7 March 1969. Another visitor (11 March) to CGCRI was Dr Cyrus Klingsberg, Executive Secretary, Committee on Mineral Science & Technology, National Research Council, USA.

Nonferrous Metals Research and Development : NML Achievements

Basic nonferrous metals are of vital importance to industrial development and to the national economy. Except aluminium, the demand for other nonferrous metals like copper, lead, zinc and tin are met by import. During 1967-68, India imported nonferrous metals to the tune of Rs 87 crores, and imports are increasing year by year with spurt in industrialization. It is estimated that the import of nonferrous metals may reach a staggering figure of about Rs 500 crores by 1975-76 if indigenous resources are not developed.

To meet the challenge of cutting down imports of nonferrous metals, the following measures are necessary: (1) utilization of existing resources, (2) survey for new deposits, and (3) substitution of imported metals by indigenous ones. In this context the National Metallurgical Laboratory (NML), Jamshedpur has done commendable research and development work on nonferrous metals technology to develop techniques for utilizing the low grade and untapped nonferrous deposits, production of substitute alloys and recovery of metals from scrap and waste.

The chronic shortage of base metals like copper, lead and zinc and absence of suitable deposits of metals like tin, nickel, etc. has made it imperative to develop the aluminium industry. Reserves of bauxite ore are enormous and can support an annual output of 5 lakh tons for over a hundred years.

Aluminium

With a view to determining the economic and commercial feasibility of exploiting new deposits of bauxite for aluminium production, investigations have been conducted by NML on the extraction characteristics of alumina from bauxites of Gujarat, Mysore and Kashmir as well as their response to Bayer's process for purifying the ore prior to smelting. Investigations have shown that over 90 per cent alumina could be extracted from these ores. Bauxites containing deleterious impurities like iron have been beneficiated to a grade suitable for aluminium extraction.

Development of aluminium-based alloys possessing high strength-to-weight ratio is a long-range research programme in which considerable progress has been made. Aluminium alloys containing high magnesium content cannot ordinarily be hot worked. Such alloys have been rendered hot workable as a result of the researches by NML.

Aluminium-silicon alloy is used in automobile, aircraft and other engineering industries. For this purpose the structure and properties of the alloy need to be modified. No single modifying agent effective in hypo- and hyper-eutectic ranges was known. Different elements were being used for modifying the structure in hypo- and hyper-eutectic ranges of the alloys. The laboratory has developed a technique of using a single modifying agent effective in both these ranges. The agent improves microstructure, fluidity, machinability and tensile strength of the alloy. The technique has been leased out to a party in West Germany.

Aluminium of 99·5 per cent purity is widely used in transmission cables. To face international competition in electric grade aluminium, the laboratory has developed an improved aluminium conductor (of purity 99·5% and above) from the indigenous electric grade aluminium. The conductor, designated PM-2, possesses better electrical conductivity, higher strength and better corrosion resistance than conventional conductors.

Metals like nickel, copper, etc. are most suited for coinage and were used in India so far. Due to non-availability of nickel resources and limited production of copper they had to be imported. The laboratory has developed an aluminium-magnesium alloy which is now being used for minting small denomination coins (1, 2, 3 and 5 paise). This alloy totally replaces nickel and copper.

The requirements of zinc needed for galvanizing and other industries are met by import. Galvanizing industries consume a bulk of the imported metal. Although zinc production has started recently in India, indigenous production does not meet the needs of galvanizing industries. The laboratory has developed three techniques of aluminizing ferrous materials. The aluminized materials are better than the galvanized ones. The techniques have been released to more than two dozen firms which are producing aluminized steel on a commercial scale.

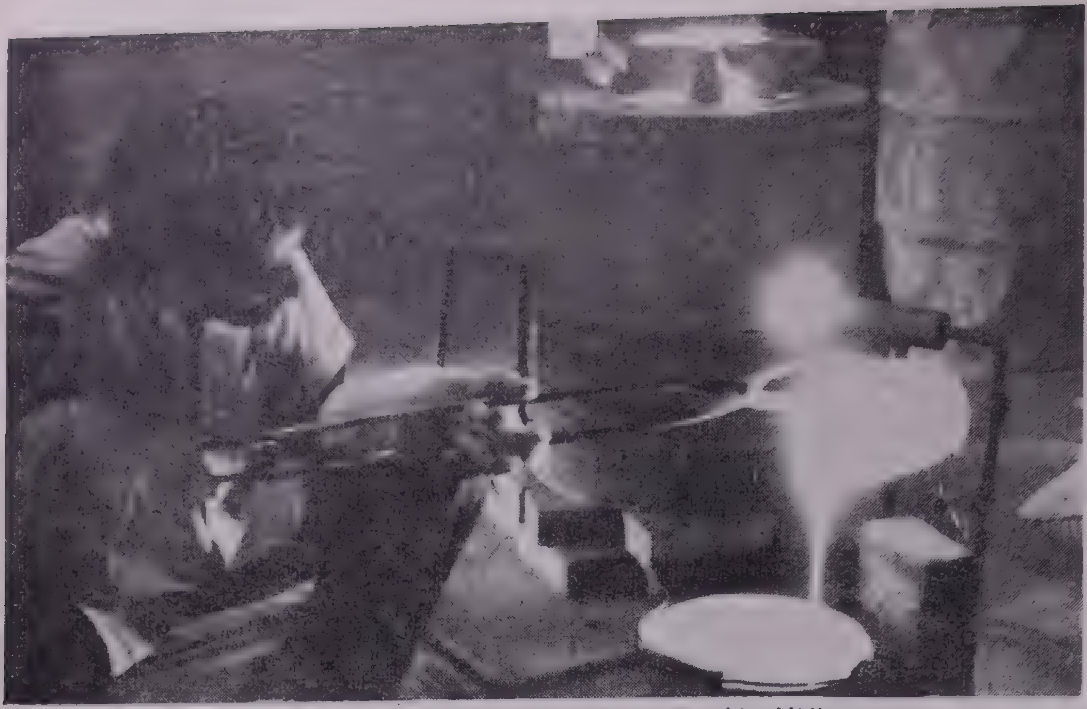
The laboratory has developed an aluminium alloy which can replace bronze bearing and thus can effect a saving in copper and tin used in the manufacture of bronze bearing materials.

The cost of aluminium production in the country can be substantially lowered if efforts are made to utilize the waste products in aluminium smelting industries. Red mud, a waste product, contains appreciable quantity of alumina which after recovery can be used for smelting of the metal. The laboratory has succeeded in recovering as much as 91 per cent of alumina from red mud. Utilization of red mud can improve the overall economics of aluminium production and hence work in this direction is under way.

In the electrification project of the railways, difficulties were experienced in melting and casting aluminium-bronze alloy. The laboratory worked out the technique of melting and casting the specified alloy (at the instance of the Railway Design and Standards Organization, Lucknow) for railway workshops, which could undertake the production of the alloy.

Copper

Copper is in short production in India and at present only one firm produces the metal. The Government of India have taken up a programme of setting up a number of smelting units in the country with a view to minimizing its import. As a first step towards exploiting the indigenous resources of copper, NML on behalf of the National Minerals Development Corporation


Melting of metal in the graphite crucible produced by NML process

Small denomination coins mac
and Gover

conducted extensive pilot plant trials on the beneficiation of low grade copper ores from Khetri, Kolihan (Rajasthan) and Rakha (Bihar) deposits. The laboratory has worked out flowsheets for upgrading the ores to render them suitable for copper smelting. These flowsheets form the basis for the new copper smelting units.

Copper powder is an important material in the manufacture of engineering products like fan bearings. A method of producing copper powder by electrodeposition has been developed and the process has been taken up for production by the Indian Copper Corporation. To minimize the use of copper in utensil industries, a substitute brass containing manganese has been developed in which the copper content has been reduced appreciably. The properties of the untensils fabricated from the substitute brass are comparable to those of conventional brass utensils.

Dross formed during the galvanizing process is a waste product containing appreciable quantity of zinc. Studies at NML on the recovery of zinc from dross have yielded promising results. The laboratory has developed a process which can be adopted for treating 100-200 kg dross per batch by galvanizers.

Manganese

India is one of the largest producers of manganese ore in the world. The ore is chiefly used for ferro-manganese production and the demand for manganese ores made by overseas market was met till recently by export of unprocessed high grade ores, and low grade ores were totally untouched. For every ton of high grade ore mined, low grade ore to the extent of 1 to 2 tons was discarded at the mine site. This practice led to the accumulation of huge dumps of low grade manganese ores at several mine sites. The laboratory has paid attention to the beneficiation of the low grade manganese ores from several states and developed techniques for upgrading different types of low grade ores to render them suitable for ferro-manganese production. Electrolytic manganese metal has many applications, particularly in making nickel-free stainless steel, nickel- and cobalt-free electrical heating elements, chrome-manganese alloys, etc. which

Vacuum zinc distillation unit, designed and fabricated at NML, for recovery of zinc from zinc dross

alloy developed by NML
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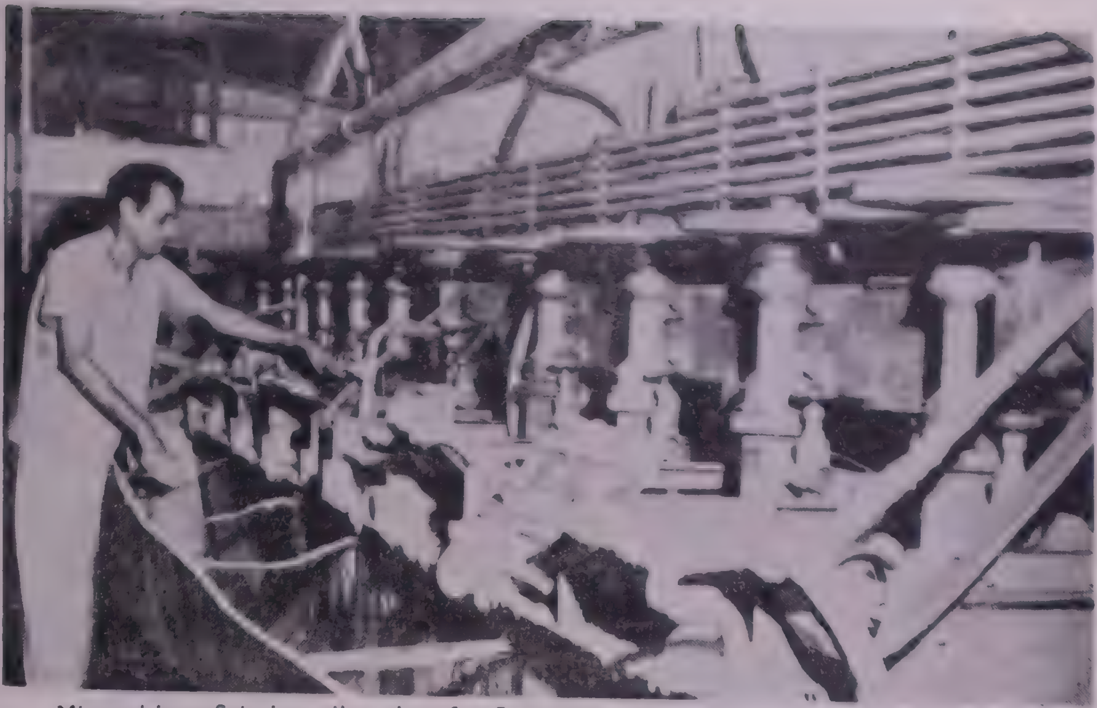


Mineral beneficiation pilot plant for flotation studies on low grade nonferrous ores

are of great significance as substitute materials. High purity electrolytic manganese dioxide produced at NML can be successfully used in dry cells in place of the imported material of similar category. Flowsheets for upgrading low grade manganese ores have been made available to mine owners and state governments. The techniques of production of electrolytic manganese metal and high purity electrolytic manganese dioxide have been leased out for commercial utilization.

Magnesium

Magnesium is a strategic metal used in aircraft, automobile, engineering and ordnance industries. The requirement of this metal has hitherto been met by import. Based on extensive work conducted on the production of this metal from dolomite, NML is now setting up a 250-ton/annum plant for the manufacture of magnesium.

Magnesium powder is used for manufacturing military requirements of explosives, and other related products. The powder deteriorates on storage and becomes unsuitable for use. To overcome this drawback, the laboratory has developed a technique for reconditioning the magnesium powder so as to render it suitable for ordnance use. Tonnage quantities of the reconditioned powder have been supplied to ordnance establishments.

Nickel

Nickel is a strategic metal and is used in the manufacture of special steels, alloys, etc. It is imported at high cost. Explorations by the Geological Survey of India have revealed several low grade nickel ores in some states. Studies were initiated at NML for extraction of nickel from the lean ores.

Investigations were made on the extraction of nickel from serpentinous ores of Assam and Rajasthan, lateritic ores of Sukinda and Badampahar area of Orissa, and a copper-nickel-molybdenum concentrate of Rakha mines, Bihar. It has been found that the serpentinous and lateritic ores of nickel cannot be upgraded by physical methods. Sulphidic ores could be concentrated by froth flotation. The potential sources of nickel for nickel extraction include the serpentinous ores of Assam and lateritic ore of Orissa. Pilot plant trials are envisaged for extraction of nickel from the indigenous ores.

Pilot plant at NML for production of electrolytic manganese metal (100 lb/day capacity)

Nickel plating salts are proprietory products and need to be imported. Owing to import restrictions the plating industry is faced with a serious problem. The laboratory has formulated dull and bright nickel plating salts which have been used by engineering firms and found at par with imported varieties. A firm is now negotiating to use the NML plating salts.

Corrosion of metals

A long-range research programme on the corrosion of nonferrous metals and alloys under industrial and marine conditions has been undertaken at the laboratory and its Marine Corrosion Research Station at Digha (West Bengal). Data have been collected on the period of exposure, rate of corrosion, nature of corrosion and other characteristics for interpreting results.

Fluorspar

Fluorspar is an important raw material for steel, aluminium and chemical industries and India's requirement is presently met by import. The laboratory has beneficiated low grade fluorspar deposits of Gujarat and Rajasthan to metallurgical and acid grade product and prepared flowsheets. The Gujarat Mineral Development Corporation and the Government of Rajasthan have taken up the beneficiation of the ores on the basis of the flowsheets supplied by NML. The Gujarat Mineral Development Corporation is also being assisted in establishing a 500 tons/day fluorspar beneficiation plant based on NML expertise.

Cryolite used in smelting of aluminium and steel is imported. The laboratory has developed a technique of preparing synthetic cryolite from low grade fluorspar beneficiated in the laboratory. The cryolite is suitable for aluminium smelting. A pilot plant for the production of 50 kg/day of cryolite is under installation.

Refractory materials

Research and development work on refractory materials required by nonferrous metals industries forms an important programme of NML. Of particular importance in this context is the work done on lining materials necessary in aluminium melting as well as on crucibles and other containers used in nonferrous foundries. About 2000 tons of graphite crucibles and shapes for melting nonferrous metals and alloys in foundries are being imported annually. The laboratory has developed products of two types, viz. clay-bonded and carbon-bonded graphite crucibles. The products have been licensed for manufacture on an industrial scale and carbon-bonded crucibles of sizes up to 200 (comparable in quality to imported ores) are now being produced in the country.

In view of the dependence of the aluminium industry on low ash anthracite coke which is being imported and absence of suitable anthracite deposits in the country, a project was taken up in the laboratory on the production of dense carbon substitute for anthracite coke from indigenous carbonaceous materials. A process has been developed by which coking coals, lignitic coals of Assam and petroleum coke can be converted into a dense carbon aggregate comparable in electrical strength and other characteristics to those of anthracite coke. A pilot plant is being set up for producing dense carbon in quantities for large scale trials in industrial aluminium cells. This material is also expected to meet the requirements of hard carbon in the production of soderberg paste used in electric arc furnaces. With the growth of the aluminium industry, there will be considerable shortage of petroleum coke in the country which is an essential material for the production of soderberg anodes for the aluminium industry. The laboratory is presently engaged in finding an economic substitute.

Zircon, available in the beach sands of Kerala, has good refractory characteristics and may form a good lining material for holding furnaces for metals such as aluminium. Studies have been undertaken to produce dense bricks as well as chemically bonded ramming mixes from zircon. It is proposed to study the economics and service performance of zircon lining materials in industrial use.

Work has been done on other nonferrous ores and minerals like beneficiation of low grade wolfram ore, preparation of beryllium oxide, extraction of zirconium dioxide from Travancore sands, treatment and smelting of ilmenite ore, etc. Smelting and casting of nonferrous metals and alloys and study of indigenous foundry moulding sands suitable for nonferrous castings are other important projects which have made considerable progress and the results obtained have been found useful by many foundries in India.

Oriented basic research

In addition to the various programmes of research pertaining to development of techniques for metal extraction, alloy smelting, treatment of raw materials, etc. and their production, oriented basic researches relating to principles of alloy making, electrodeposition, physical properties of nonferrous metals and alloys are also undertaken by the laboratory. These researches have thrown light on the structure of liquid metals, phase transformation in electrolytic alloys, age-hardening in aluminium-copper alloys and heat content and heat capacity of liquid nonferrous alloys.

Nonferrous metals symposium

The laboratory organized recently an international symposium on 'Recent Advances in Nonferrous Metals Technology in Jamshedpur (Dec. 1968) to focus attention on the need for increasing the indigenous production of various nonferrous metals and the overall strategy to be adopted for reducing imports of many strategic metals like nickel, tin, cobalt, molybdenum and tungsten by developing new alloys. Sixty papers were presented and discussed under the topics: (1) alumina—its extraction and uses; (2) physical metallurgy of aluminium; (3) scarce and strategic nonferrous metals; (4) physicochemical founding aspects of nonferrous metals and alloys; (5) utilization of indigenous resources of copper and their extraction techniques; (6) treatment of wolframite, gold ore, magnetite, titanium, zirconium, niobium and tantalum ores; and (7) role of nonferrous metals in Indian industries.

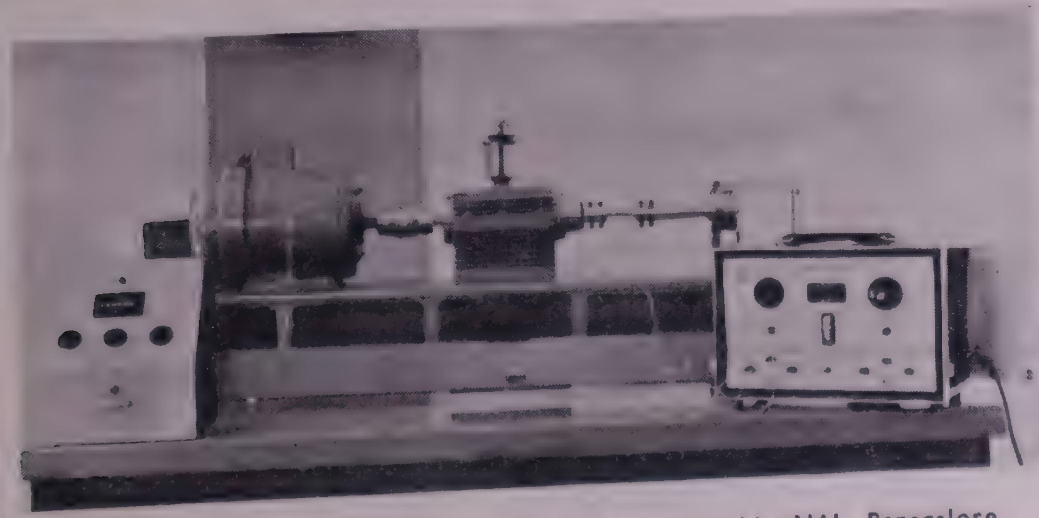
NAL EQUIPMENT AND DEVICES READY FOR COMMERCIAL UTILIZATION

The National Aeronautical Laboatory (NAL), Bangalore has deveoped a number of equipment and evices in an effort to conserve oreign exchange and to develop ndigenous technical competence. A atigue testing machine and two evices, vibration pick-up and ibration meter, have been deveoped. The manufacturing knowhow is now ready for release to ndustry for commerical utilization.

Fatigue testing machine

More than 90 per cent of the service failures in aircraft and machinery are due to fatigue. The high operating speeds of modern machineries and the extreme stress ranges to which the materials of construction are subjected, make fatigue testing a necessity. Most of the fatigue machines presently in use are imported. With a view to obviating the import of much machinery NAL has taken up a programme of design and development of a variety of fatigue testing machines.

The laboratory has developed under this programme a rotating cantilever fatigue testing machine. In this machine, the specimen is supported as a cantilever and loaded by dead weights applied at the free end through a self-aligning bearing which permits both verticality of loading and the rotation of the specimen. A counter-balancing lever system is used to balance the dead weight of the loading assembly. As the specimen is rotated by an induction motor, each point on the circumference of the specimen is subjected to an alternating stress, which varies sinusoidally from tension to equal compression. The bending stress at the test section is calculated using beam formula. The specimen geometry is limited to circular cross-sections. A cut-out switch is provided to stop the machine when the specimen fails. To record the number of cycles resulting in the failure of the specimen, a six-digit counter is fitted to an extension of the motor shaft through a 1 : 20 reduction gear and this records up to 2×10^6 reversals. The machine is useful for evaluation of the materials on the basis of S-N curves.



Rotating cantilever fatigue testing machine developed by NAL, Banagalore

Vibration pick-up

This is a self-generating contact type pick-up (size, 50 mm×50 mm; weight, 300 g) working on the principle of electromagnetic induction between a stationary coil and a seismically suspended magnet. When mounted on a vibrating structure the pick-up provides an output voltage proportional to the velocity of motion of the structure. Its nominal sensitivity is 35 mV/in/sec; frequency range, 50 c/s to 2kc/s; and maximum amplitude range, 1 mm. In conjunction with a vibration meter the pick-up may be used for the measurement of velocity, displacement and frequency of the structural vibrations.

VIBRATION PICK UP
CMV 1
SL NO 003
NAL BANGALORE

Vibration pick-up developed by NAL, Bangalore

Vibration meter

The vibration meter is a single channel instrument which can be used with any self-generating pick-up for measurement of displacement, velocity and frequency of mechanical vibration. It provides direct readout of the various parameters (velocity 0·05 in/sec to 500 in/sec, displacement 0·05 mils to 500 mils, and frequency 5 c/s to 5000 c/s) with a linearity of ± 2 per cent. A gain control is provided for varying the sensitivity so that the instrument may be calibrated with an internal calibration signal for use with any velocity pick-up having sensitivity in the range 25 mV/in/sec to 125 mV/in sec. The unit is fully transistorized.

Vibration meter developed by NAL, Bangalore

The vibration pick-up and the vibration meter have been batch produced in the laboratory's pilot plant and supplied to various research and development organizations in India and their performance has been proved. These devices are very much cheaper than the imported ones and will be good import substitutions.

The terms and conditions for the release of know-how can be had from the Director, National Aeronautical Laboratory, Post Bag No. 4, Bangalore 17.

SPONSORED RESEARCH

Completed Schemes

Coal Blending & Coking Research

Intensive tests on pilot plant scale were carried out with weakly coking and/or noncoking coals in admixture with prime coking and medium coking coals with a view to ascertaining the possibility of utilizing such coals for coking purposes. Tests were also undertaken with coal blends in commercial ovens to confirm the results obtained in pilot plant trials.

A series of full-scale oven tests were carried out with coking coal mixture to confirm the results obtained in the pilot oven tests carried out at the Central Fuel Research Institute, Dhanbad in connection with selection of blends for Rourkela and the projected Bokaro steel plants. The results have indicated that 10 per cent of the Poniati seam coal from the Raniganj coalfield could be blended with 70 per cent of Patherdih washed and 20 per cent of Laikdih seam coal to produce hard coke. Experiments carried out with Sanctoria seam coal from Raniganj coalfield have indicated that a maximum of 15 per cent of this weakly coking coal could be blended with washed Jamadoba-Bokaro coal mixture. Taltore seam coal (10-15%) from Raniganj coalfield when blended with requisite proportions of washed Jamadoba-Bokaro coal mixture yielded hard coke suitable for metallurgical purposes.

The studies have established the feasibility of blending 10-15 per cent of noncoking coals with good coking coals available in the country, thus contributing to conservation of the limited resources of metallurgical coal.

The researches were carried out during the year 1968 under the auspices of the Coal Blending and Coking Research Sub-Committee, Jamshedpur.

New Schemes

Studies on the Flora of Bombay

The Biological Research Committee has sanctioned the above scheme for a period of 2 years at St Xavier's College, Bombay. The studies are being carried out under the guidance of Rev. Fr H. Santapau. The main aspects of the study are (1) completion of the flora of Saurashtra, (2) the flora of the Dangs Forest, and (3) revision of the 'Flora of the Bombay Presidency' by Th. Cooke. Under the series, flora of Saurashtra (after a field work of over 10 years), part I was published in 1962; part II is more than half ready; part III is to be completed under the scheme; and the last part will cover the illustrations. The studies on the flora of the Dangs Forest will be undertaken in collaboration with Prof. G. L. Shah.

Glucose-Amino Acid Metabolism in Normal and Malignant Tissues

The study was carried out by Mrs Leena Chaudhuri of the Indian Institute of Experimental Medicine, Calcutta under the guidance of Dr G. C. Shrivastava, and led to the award of D.Phil. degree (Calcutta University) in Dec. 1968.

Swiss mice injected with a fibrosarcoma were fed a diet containing 8 per cent glucose. Unlike the injected control groups, the animals kept on a glucose supplemented diet did not show any tumour development. Glutamine was absent in the chromatograms of the skin surrounding the malignant growth, whereas the chromatograms of tissue distant from the tumour and of tissue from the site of injection in the glucose-fed groups showed the presence of glutamine. The blood sugar and glutamine levels were lower in mice injected with tumour and kept on glucose-free diet. Glucose-feeding not only increased the blood sugar value but also maintained a normal level of glutamine. It has been shown that the lower level of glutamine in the tumour-bearing mice is not due to increase in the glutaminase similar to that in the controls.

It has also been shown that th lactic dehydrogenase of tumou tissue as well as spleen and live from the tumour-bearing animal shows a partial dependence o NADPH (reduced nicotinamid adenine dinucleotide phosphate) an that the tumours and other tissue of the host animals differ from thei normal counterparts in this respect.

Deputations

Dr D. Sen, Scientist, Nationa Physical Laboratory, New Delhi wh was deputed to UK under Colomb Plan for three months' training i precision optical measurement an testing at the Optical Metrology Division, National Physical Laboratory, Teddington returned an resumed duty on 6 Feb. 1969.

Shri B. A. Shenoi, Scientist, Central Electrochemical Research Institute, Karaikudi on deputation to USSR for four months' training in applied electrochemistry under Indo-Soviet Cultural Exchange Programme returned and resumed duty on 1 March 1969.

Doctorates

Shri A. B. Upadhye, NCL, Poona—Ph.D. (Bombay University); thesis: *Chemistry of lac* (Guide: Dr Sukh Dev).

Shri M. I. H. Farooqi, NBG, Lucknow—Ph.D. (Aligarh Muslim University); thesis: *Studies o polysaccharide gum from* Albizzia procera *Benth.* (Guide: Prof. I. P. Varshney).

Shri Shiv Mohan Singh, CBRI, Roorkee—Ph.D. (Roorkee University); thesis: *Physico-chemical studie on building paints for tropics* (Guides: Drs Wahid Uddin Malik and Joseph George).

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CSIR NEWS

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eneficiation of Rakha Copper res

ML Studies

Batch and pilot plant beneficia- on studies on the recovery of pper, nickel and molybdenum om low grade copper ore, assay- g to Cu, 1.34; Ni, 0.053; and Mo, .016%) from Rakha mines of the industan Copper Ltd have been rried out by the National Metal- rgical Laboratory, Jamshedpur. atch scale bulk flotation tests indi- ted that 95.7 per cent copper, .6 per cent nickel and 94.4 per nt molybdenum present in the mple could be recovered by flota- n from the feed ground to 60 per nt −200 mesh using 1.6 kg/tonne lime, 0.06 kg/tonne of sodium opropyl xanthate and 0.09 kg/tonne pine oil.

Batch scale differential flota- n of molybdenum followed by four eanings of the molybdenum float d bulk sulphide flotation of the ilings from the molybdenum cir- it indicated that a cleaner molyb- num concentrate (Mo, 33.7 and , 1.4%) with a recovery of 60.2 r cent molybdenum and a copper- ckel concentrate (Cu, 22.02 and , 0.28%) with 87.4 and 25.3 per nt recoveries respectively could obtained. In the differential flo- ion tests, the feed ground to 66 r cent −200 mesh was floated ing 0.3 kg/tonne of sodium cya- le, 0.2 kg/tonne of sodium sili- te, 0.16 kg/tonne of lime, 0.08 /tonne of sodium isopropyl xan- te and 0.12 kg/tonne of pine oil.

Pilot plant studies based on the sults obtained on batch scale experiments indicated the feasibility of recovering about 61.9 per cent molybdenum, 94 per cent copper and 30.8 per cent nickel from the Rakha copper ores. The final molybdenum concentrate assayed to Mo, 33.0; and the copper-nickel concentrate assayed to Cu, 20.07; Ni, 0.26; and Mo, 0.09 per cent.

The laboratory has also developed a flowsheet for beneficiating 1 000 tonnes ore/day.

Enzymatic Formation of Diiodotyrosine

Studies on the enzymatic formation of diiodotyrosine have been carried out at the Indian Institute of Experimental Medicine, Calcutta.

A microsomal enzyme preparation from goat submaxillary glands catalyzed effectively the formation of diiodotyrosine. Other subcellular fractions, i.e. soluble supernatant and mitochondria, were also capable of catalyzing this reaction but their activities were much less than those of the microsomal fraction. The enzyme required cupric ion for its activity and the requirement of copper was completely substituted by slow addition of H_2O_2. The iodinating activity was inhibited by anaerobiosis and catalase. The enzyme activity was stimulated by reduced glutathione and inhibited by PCMB and iodo-acetate, suggesting the presence of active -SH group in the enzyme. Ascorbic acid stimulated the iodination by more than 400 per cent. Mn^{+2} and Fe^{+3} inhibited the DIT formation. The optimum pH of the enzyme for the iodination of MIT was 7.6. A linear relationship between DIT formation and time was observed with a short initial lag period which was not observed in the presence of ascorbic acid. The Michaelis constants of the enzyme for MIT, Cu^{+2} and H_2O_2 were found to be 2.17×10^{-4}M, 6.6×10^{-3}M and 2.5×10^{-5}M respectively. Thiourea and thiouracil (10^{-4}M) inhibited the iodination significantly. Chloride and bromide did not interfere with this iodination reaction. The enzyme was reasonably stable and lost about 50 per cent of its activity within 7 days. The microsomes were solubilized by Na-desoxycholate without any appreciable loss in enzymic activity.

Board and Governing Body Meetings

The Board of Scientific & Industrial Research and the Governing Body of CSIR will meet on 13 and 14 May 1969 respectively at 5.30 p.m. in Room No. 9, Parliament House, New Delhi. Shrimati Indira Gandhi, Prime Minister and President, CSIR will preside over both the meetings.

The enzyme preparation could iodinate tyrosine to MIT also quite effectively. Most of the properties of the tyrosine iodinating activity were similar to the MIT iodinating activity. But the effect of Mn^{+2} was quite different on the iodination of tyrosine. Instead of inhibiting as shown in the iodination of MIT, Mn^{+2} stimulated the iodination of tyrosine. Maximum activity of the enzyme for iodination was observed at pH 8.5. The Michaelis constant of the enzyme for tyrosine was 1.8×10^{-4}M. Other amino acids like histidine, tryptophan and phenylalanine were not iodinated by the enzyme.

A significant amount of peroxidase activity was observed in the solubilized microsomes. The peroxidase activity was stimulated by KI. The KI-stimulated peroxidase activity showed a biphasic curve with increasing concentration of H_2O_2 and the optimum H_2O_2 concentration was found to lie between 0.08 and 0.12 *mM*. The Michaelis constant of the enzyme for H_2O_2 was 6.7×10^{-5} *M*. The optimum pH of the peroxidase was 6.0. The peroxidase activity was inhibited by thiourea, thiouracil, CN^-, N_3^-, reduced glutathione and ascorbic acid. DPN^+, TPN^+, FAD and cytochrome C stimulated the peroxidase activity.

The researcher Shri Ratha Nath Hati of the institute, who carried out the investigation under the guidance of Dr Asoke G. Dutta, was awarded the D. Phil. degree by the Calcutta University for his thesis entitled: Studies on the formation of diiodotyrosine by a microsomal enzyme from goat submaxillary gland.

IIP Annual Report: 1967-68

The Annual Report of the Indian Institute of Petroleum, Dehra Dun reveals that a major proportion of the institute's efforts were devoted to the evaluation of crude oils and products and process and product development. Projects which received the major attention of the institute were lube oil evaluation, catalytic reforming, hydrogen processing, speciality products and additives, process design, performance evaluation of lubes and fuels, and synthesis of protein from petroleum fractions.

Lakwa and Rudrasagar crudes were evaluated with a view to exploiting the indigenous crudes for refinery expansion. Between Lakwa and Rudrasagar crudes the former resembled Nahorkatiya crudes to a greater extent, and sulphur content in both crudes was low. The composition of the Kalol crude middle distillates has been determined. Visbreaking of the Nahorkatiya reduced crude has been completed. The 150° fuel oils obtained from the visbreaking of Nahorkatiya reduced crude were found to pass the ASTM test for thermal stability of US Navy fuel oils.

Straight run kerosene fraction from Aghajari crude, likely to be used in the Haldia refinery, is not colour stable. The kerosene fraction has been rendered colour stable by hydrotreatment.

The octane requirements of Indian car engines with buildup of mileage have been evaluated. It has been found that the presently marketed gasoline does not meet the requirements of Indian car engines. The effect of using low octane gasolines has been studied and the economics of increasing road octane number from 79 to 83 have been worked out. To meet the requirement of reference grade isooctane for engine testing a batch reaction apparatus has been set up for preparation of 90 litres of isooctane by liquid phase conversion of *tert*-butyl alcohol.

In connection with the evaluation of antiknock performance of fuels in automotive engines in actual practice, facilities were developed for determining the road octane number (RON) of the fuel by the modified Union Town method in which an arrangement was required for continuously varying the spark advance from inside the car cabin when in motion. *p*-*tert*-Butylphenol of 99 per cent purity has been obtained by butylation of phenol with isobutylene using the catalyst BF_3; *p*-*tert*-butylphenol is used in the processing of natural and synthetic rubbers, vinyl polymers, paints and varnishes, textiles, as additives in lubricants and jet fuel and as an intermediate for various chemicals.

Studies on the preparation of graft polymers of styrene with natural rubber have been carried out. Optimum conditions for the production of uniform and good solid grafted polymer beads have been worked out.

Among the equipment and de
vices developed by the institut
mention may be made of: (i) a de
vice to adjust the fuel feed in in
ternal combustion engines workin
at high altitudes, at the instance
the Defence Department; and (ii)
fuel-air mixture correction devic
for varying the fuel supply rate
improve the high altitude perfor
mance of the Willys jeep engine.

The pilot plant for the pro
duction of town gas from naphth
was nearing completion. The pil
fermentation unit for the productio
of protein concentrates from petro
leum fractions was commissione
A test run was made using hea
gas oil from the Barauni refine
and the results were comparable
those of the laboratory experiment
A lube reclamation plant of 5
tonnes/annum capacity was de
signed.

In the field of basic researche
liquid solubility determinations
polythene for various hydrocarbo
have been carried out at 25°, 3
and 50°C.

The institute worked out for th
FACT Engineering & Design Orga
nization process design details
hydrodesulphurization of naphth
based on the process developed
IIP in collaboration with the Frenc
Institute of Petroleum, Paris. Th
institute offered consultancy ser
vices to the Indian Oil Corporatio
Ltd for building at Madras a lub
oil blending plant to blend 70 0
tonnes/year of base-stocks avai
able from the Madras refinery.

DEPUTATIONS

Shri P. K. Goel, Scientis
Indian Institute of Petroleum, Deh
Dun left on 31 March 1969 for US
(Bureau of Mines, Bartlesvill
Oklahoma; Lubrizol Corporatio
Cleveland, Ohio; Mobil Research
Development Corporation, Ne
York; Franklin Institute, Philade
phia; Witco Chemical Co., Ne
York; etc.) for two months under th
India-USA Exchange Programme,
acquaint himself with the work bei
done in the field of lubrication a
additives. Later he will spend tw
weeks at the Institut Francais
Petrole, France.

Inventions Promotion Board's Awards to CSIR Inventions

Four inventions made by CSIR ientists have been awarded cash izes by the Inventions Promotion ard, New Delhi which announced e awards during the last Republic ay (26 January 1969). The Board ves awards ranging from Rs 500 Rs 10 000 to scientists, engi- ers, technologists, artisans and chnicians for outstanding inven- ons. The awards are given twice year — on Republic Day and dependence Day.

The Council's scientists who ave received the 1969 Republic Day wards, announced by the Inventions romotion Board are: (1) Dr S.K. arat, Central Leather Research nstitute, Madras for developing a ovel and economic process for the nanufacture of dry and ready-to- et sausage casings and allied pro- ucts from animal intestines Rs 2 000); (2) Sarvashri G.D. oglekar and C.L. Verma, National hysical Laboratory, New Delhi for nproving the technique and deve- oping equipment for the manu- acture of arc lamp carbon rods ith core and shell materials of ifferent compositions (joint award f Rs 1 000); (3) Sarvashri C.P. rivastava, B.R. Guha and B.B. rasad, Central Mechanical Engi- eering Research Institute, Durga- ur for developing a flux compo- ition and a technique of furnace razing of aluminium and its alloys, hich has resulted in the fabri- ation of the all-aluminium evapo- ators used in refrigerators (joint ward of Rs 1 000); and (4) Dr P.B. athur and Shri N. Karuppannan, entral Electrochemical Research stitute, Karaikudi for developing now-how for indigenous manu- cture of silver oxide-zinc cells oint award of Rs 1 000).

ry Ready-to-Wet Sausage Casings

Intestines of cattle, goat, sheep d pig are obtained in considerable antities from slaughter houses. certain places the intestines are ld to the poorer sections of the population for edible purposes, and considerable quantities are wasted or lost through improper methods of processing and hence are unsuitable for export. Intestines are highly susceptible to degradation particularly in the moist condition and may undergo deterioration in transit and storage even in the wet-salted condition in which state they are at present preserved and exported. Under suitable conditions, however, these constitute an important raw material for the manufacture of sausage casings, absorbable type of surgical sutures, sports guts, musical instrument strings, etc., all of which besides having a considerable domestic demand possess export potential.

Dr S.K. Barat, CLRI

A process for the preparation of dry ready-to-wet casings of greatly improved appearance and prolonged shelf-life from cattle, goat, sheep, pig and other mammalian intestines has been developed by the Central Leather Research Institute, Madras. The mammalian small intestines consist of five concentric layers one of which, viz. submucosa layer, is collagenous. This has been purified and rendered free of noncollagenous material. The process involves washing and scraping the submucosa layer, subjecting it to a mild chemical treatment of cleaning and bleaching, followed by treatment with dilute acid solution and an oil emulsion to remove the noncollagenous material.

SAUSAGE CASINGS: The inflated, ready-to-wet casings, produced by a process developed at CLRI, Madras from the intestines of cattle, goat, sheep and pig are imputriscible and resistant to the attack of microorganisms

The casings are obtained in a dry and clean form with fine gloss and water-white shade capable of being instantly soaked back to their original gloss and bloom. Processed out of the small intestines of healthy animals under conditions of high sanitation and hygiene, the casings can be supplied in fully sterilized form also. The processed casings on inflation and drying are obtained in a form which needs no special packing or treatment, and can be stored as such indefinitely under normal conditions. Specially treated so as to make them resistant to moulds and fungi unlike the conventional wet-salted products, the processed casings are completely free from superfluous salt and water and as such can be air freighted at a very much reduced cost. They are also free of harmful chemicals. Hitherto no processed casing has been obtained in such a clean, dry, ready-to-wet form. This is a novel line of development and is expected to lead to a complete change in the conventional pattern of the concerned trade and industry dealing in wet-salted products.

The process has been patented in India (Pat. No. 90469), UK, USA, USSR and a number of other countries in Europe. The product has also been tested in almost all the principal consuming countries of the world and found satisfactory.

Simultaneous Extrusion of Core and Shell Materials

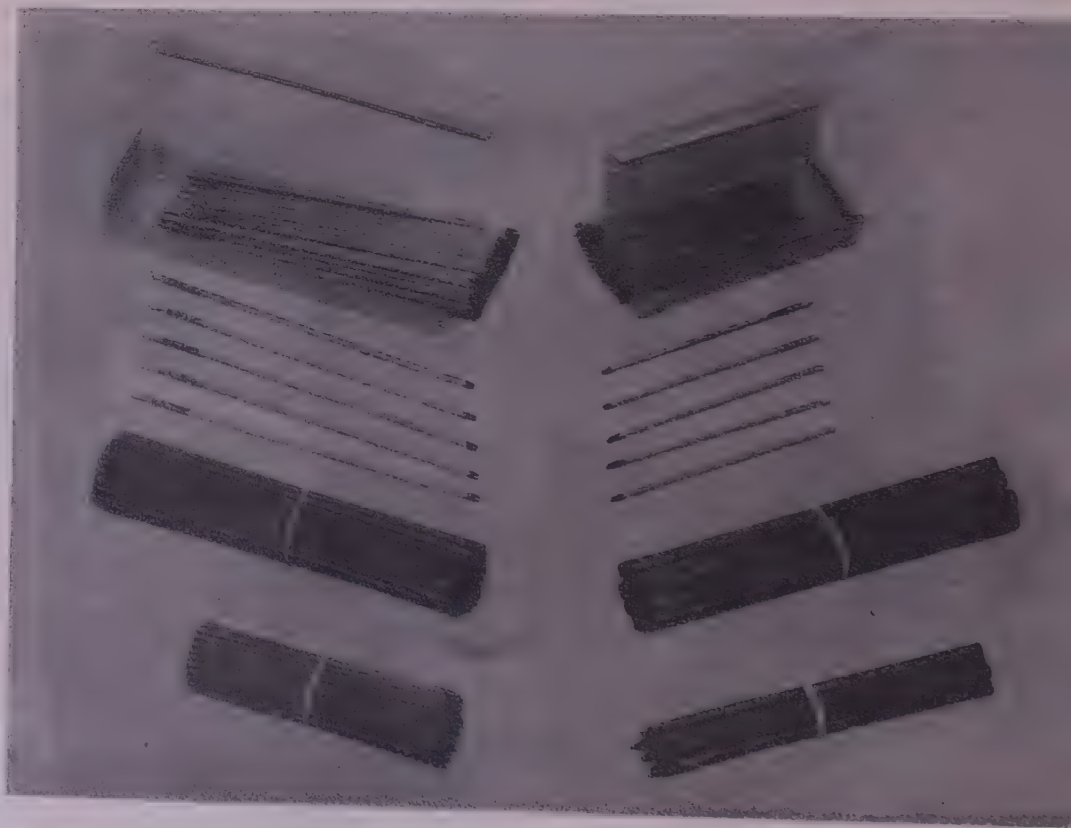
High intensity arc carbons find wide application in the projection of motion pictures, searchlights, studio illumination, block-making, etc. The arc carbons are copper plated cylindrical rods with a shell of carbon and a core of inorganic light emitting salts. The conventional process of manufacture consists in mixing the carbon powder with binder, extruding the tubes, baking and filling the tubes with core material and rebaking the rods. The drawbacks of the method are that: (1) an elaborate filling equipment is required; (2) rebaking of the baked and filled tubes is necessary to set the

Shri G.D. Joglekar, NPL

Shri C.L. Verma, NPL

core material inside the tube; (3) an apparatus such as X-ray unit is required for examining the continuity and uniformity of core; and (4) the core material may come out during handling or use.

In the process developed by NPL, New Delhi, the core and the shell materials are simultaneously extruded, thus doing away with all the various stages. The new process has none of the drawbacks o the conventional process. A compact, homogeneous and continuou core is obtained by this method The core material is centrall placed in the extruded rods and th composition of the core is differen from that of the shell. A specia feature of the process is that ther is no intermixing of core and shel



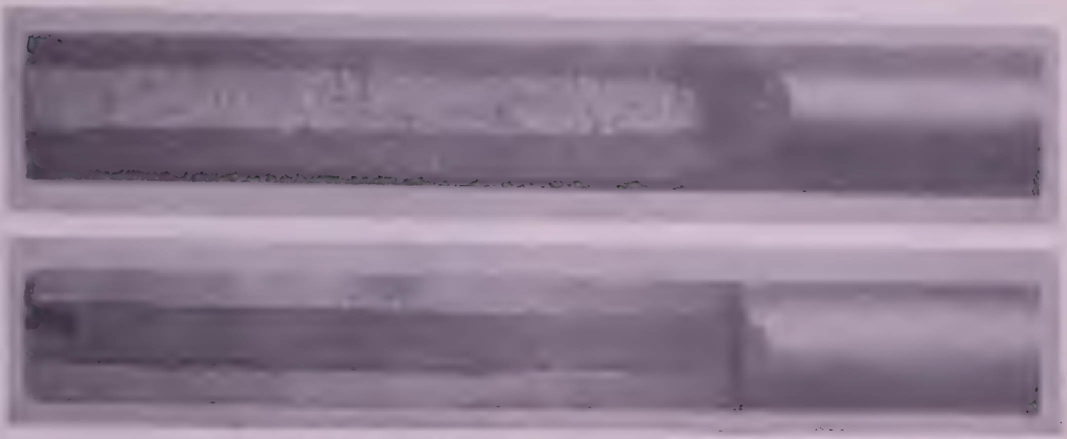
ARC CARBONS FOR HIGH INTENSITY ILLUMINATION: **These carbon rods, which contain a central core of light emitting salts held in a carbon shell, are extruded by simultaneous extrusion of core and shell material, a process developed and patented by NPL, New Delhi. Uncoated projector carbons (left) and process carbons (right) are seen**

uring the extrusion process. The
lasticity and shrinkage of the shell
nd core mixtures after baking are
naintained at a desired level by
djusting their binder contents.

The new process is more eco-
omical than the conventional pro-
ess, since two operations are eli-
ninated. The main raw materials,
uch as retort carbon, petroleum
oke, coal tar and coal tar pitch,
equired for the manufacture of
arbon cores and shells, are in-
igenously available.

A pilot plant for producing
rojector carbons and carbon brush
locks has also been designed and
abricated by NPL. This plant in-
ludes a 40-ton extrusion press
hich has been designed and fabri-
ated by NPL using entirely indi-
enous materials. The press has
een in operation for five years and
as extruded over a lakh carbon
ods. Carbon rods with dia-
neters varying from 6 mm to 22
nm have been produced. Over
0000 pairs of projector carbons
f sizes 6 x 7 mm, 7 x 8 mm and
x 9 mm have been produced and
old. Over 60000 carbon rods,
alued at about Rs 70000 have also
een produced and sold.

The process, which has been
atented in India (Pat. No. 85787),
s being leased for commercial
tilization through the National
esearch Development Corporation
f India.



SECTIONS OF ARC CARBON MADE AT NPL (TOP) AND OF IMPORTED BRAND (BOTTOM): The NPL arc carbon, made by simultaneous extrusion of core and shell materials, shows a continuous homogeneous core without defects. The imported brand, made by the conventional process, shows less compact cores resulting in cracks

ll-Aluminium Refrigerator vaporators

All-aluminium evaporators have
ot been used so far for refrige-
ators in India, since indigenous
now-how for joining aluminium
ibe coils to aluminium sheets was
ot available in the country. Brass
heets and copper tubes are being
sed in the manufacture of the
vaporating body. With a view to
eplacing copper, a scarce metal,
y aluminium, the Central Mecha-
ical Engineering Research Insti-
ute, Durgapur has developed a
chnique and suitable fluxes for
furnace brazing of aluminium sheet to aluminium tube, and of aluminium to copper. The technique has been successfully applied for the manufacture of evaporators used in refrigerators.

The process consists of the following steps. Sheets and tubes are thoroughly cleaned free of oil, grease and aluminium oxide by a chemical treatment and are assembled for brazing. The brazing alloy (5% Al-Si alloy) in the form of 1/16 in. dia wire is placed in position along the joint and the assembly is held together by suitable fixtures. The joint clearance between the tube and the sheet is maintained between 0.15 and 0.25 mm to ensure satisfactory flow of the brazing alloy. The brazing operation is carried out in a horizontal box type forced air circulation furnace maintained at 625° ± 5°C by keeping the assembly in the furnace for a predetermined period of time. When the assembly is withdrawn from the furnace a neat joint is formed all along the length of the coil. The assembly is next partially cooled in air, quenched in boiling water and allowed to remain in it for above 10 min. This operation removes bulk of the residual corrosive flux. Further treatment with 50 per cent aqueous solution of nitric acid for 15 min leaches out the remaining flux. The assembly is rinsed in water, dried and bent to form a complete evaporator.

Aluminium conforming to IS: 738-1965, which is indigenously available, has been found suitable for fabricating the tubes required in the manufacture of evaporators. Mechanical and metallographic tests carried out on the joints have shown a good metallurgical bond between the tube and the parent material. The aluminium evaporators, produced by CMERI, have

Shri C.P. Srivastava, CMERI

Shri B.R. Guha, CMERI

Shri B.B. Prasad, CMERI

been used in domestic refrigerators and it has been found that the ice forming time is practically the same as in the case of evaporators made out of brass sheets and copper tubes.

An advantage of using all-aluminium evaporators is that the metal can be anodized to any pleasing colour to match the interior of the refrigerator. In the technique developed by CMERI, the two ends of evaporator tubes are provided with small pieces of copper connector tubes so that the evaporator could be connected to the refrigeration circuit. Field repairs can also be done using the conventional method of silver brazing between copper and aluminium. A satisfactory joint between copper and aluminium has been produced using zinc-aluminium solder (Zn, 95 and and Al, 5%) with a suitable flux.

The cost of evaporator produced by this method works out to about Rs 20 per piece, and is cheaper than that produced by the existing process. Taking the present annual production of both domestic and commercial refrigerators in which copper tubes are used, it has been worked out that a saving of about Rs 22 lakhs could be effected if copper tubes are substituted by aluminium tubes.

ALUMINIUM REFRIGERATOR EVAPORATORS: This all-aluminium evaporator was fabricated by CMERI, Durgapur adopting the technique of furnace brazing of aluminium tube to aluminium sheet developed by the Institute

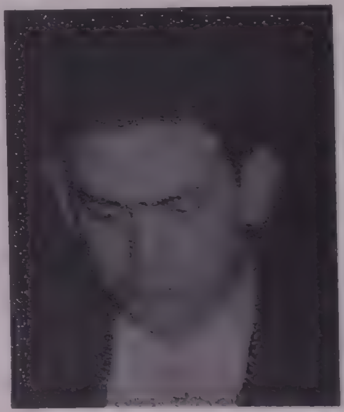
Silver Oxide-Zinc Battery

The demand for high energy batteries with miniature volume and weight has gone up with the development of sophisticated equipment and devices, such as are used in high altitudes and space research and in electronic gadgets. Silver oxide-zinc battery is one of the highest energy density battery systems commercially developed and finds wide applications, particularly in defence equipment and devices used in high altitudes.

The Central Electrochemical Research Institute (CECRI), Karaikudi has developed light-weight high-energy AgO-Zn batteries and perfected their performance characteristics.

The battery consists of a porous silver electrode and a specially designed zinc oxide cathode separated by thinnest separator material, viz. paper. The battery possesses one-fifth the weight and volume of lead-acid, nickel-cadmium and other batteries of equal power. Working on an average voltage of 1.5 V, the battery operates in the temperature range -30° to + 65°C and can be drained at very high current drains unlike conventional batteries. A major advantage of the battery is that an already formed AgO-Zn battery can be activated by the introduction of the electrolyte in 8 sec and hence this cell has been found to be the most appropriate power source for missiles.

The cells (20 amp hr capacity) developed by CECRI have been subjected to rigorous tests with regard to their capacity performance at normal temperature, sub-zero temperatures (up to -30°C) at low drains and very high drains short



Dr P.B. Mathur, CECRI

Shri N. Karuppannan, CECRI

LVER OXIDE-ZINC CELLS: Light-ight high energy AgO-Zn battery (20 p hr) developed by CECRI, Karaikudi. e battery works on 1.5 V and operates tween -30°C and +65°C. It can be ained at very high current drains unlike conventional batteries

rcuit current, dry heat storage at)°C, dry heat discharge cycle at)°C, humidity test at 95 per cent midity at 20-35°C, life-cycle sts, etc. The cells have given ood performance and are being sed by the Thumba Equatorial ocket Launching Station in the ocket payloads.

The process for the preparaon of the cells has been patented India (Pat. No. 103972) and is ady for commercial utilization; e National Research Development rporation of India is negotiating r the release of the know-how.

SDOC TRAINING COURSE SCIENTIFIC TRANSLATION

amination Results

Following candidates who took e final examination of the Insdoc ining course in scientific transion (Russian) in Dec. 1968 have en declared successful (in order merit): Radhashyam Saha (CFRI, anbad); B. D. Baliga (CMRS, anbad); and A. K. Chowdhury GCRI, Calcutta).

CEERI DEVELOPED CERAMIC PICKUP READY FOR COMMERCIAL DEVELOPMENT

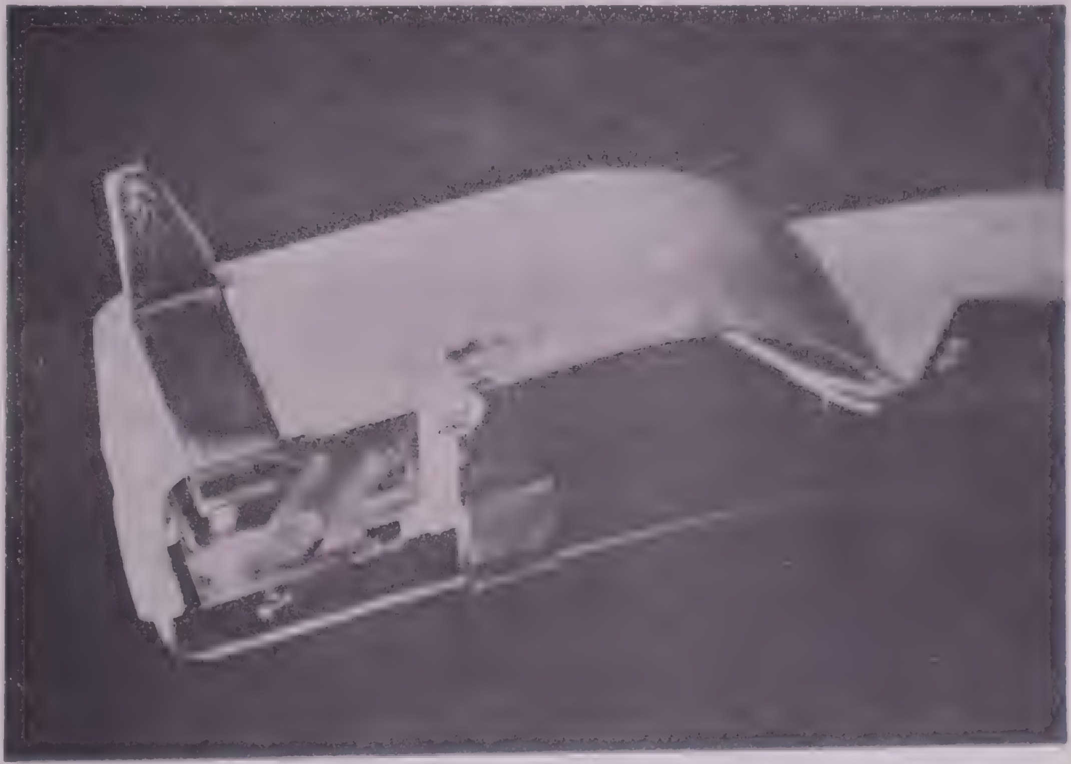
The quality of reproduction from the record player depends mainly on the performance characteristics of its pickup. The record players manufactured in the country presently use imported pickups.

In view of the growing demand for the pickups in the country, the Central Electronics Engineering Research Institute (CEERI), Pilani initiated a project on the research and development of piezoelectric ceramic pickups using lead-zirconium titanate ceramics developed at the National Physical Laboratory, New Delhi.

Ceramic pickups have a number of advantages, viz. (1) high sensitivity, which gives adequate output voltage to drive the grid of the first audio stage in a radio set; (2) good stability and freedom from the effects of temperature and humidity; (3) freedom from the effects of magnetic fields of the record changer motor, power transformer, etc.; (4) simpler equalization circuits, as output is proportional to displacement; and (5) small size and low weight to facilitate low needle loads required in the modern design.

The specifications of the ceramic pickups are: frequency response, 30-9 000 Hz (within + 5 db); output voltage, 50-60 mV at 1 kHz; load impedance, 1 Meg or more and needles for LP and 78 rpm records. Besides, the CEERI pickup has the following advantages (1) ease of mounting of the pickup on the arm of conventional record players; (2) ease of changing over of needles for standard (78 rpm) and microgroove records; (3) ease of replacement of needles; and (4) suitability of the design for mass production techniques.

The investment on machinery and equipment is Rs 5 000 on an installed capacity of 1 500 pickups per month. The cost (ex-factory) of the indigenous product is Rs 14 against the retail price of the imported pickup at Rs 24.50.



CERAMIC PICKUP: Designed and developed by CEERI, Pilani, the piezoelectric ceramic mono pickup has sapphire needles directly attached to the transducing element through a coupler

Parties interested in undertaking the commercial development of the ceramic pickups may correspond with the Secretary, National Research Development Corporation of India, Mandi House, Lytton Road, New Delhi 1.

HONOURS AND AWARDS

Dr H.A.B. Parpia, Director, Central Food Technological Research Institute, Mysore was the recipient of the Kashalkar Memorial Award (instituted by the All India Food Preservers' Association) in New Delhi on 29 March 1969. The award was presented by the Minister of State for Food & Agriculture, Shri Anna Saheb Shinde. Shri P.H. Bhatt, Chairman of the Association, referred to the contributions of Dr Parpia towards the development of the food industry.

Dr K.N. Sinha, Director, Central Mining Research Station, Dhanbad has been awarded the 1969 National Mineral Award (scroll of honour and cash Rs 3 000) for his contributions to the Indian mining industry. The award was presented to Dr Sinha by Dr Triguna Sen, Minister of Petroleum & Chemicals and Mines & Metals at a function held in the Geological Survey of India, Calcutta on 4 April 1969. The National Mineral Awards have been instituted by the Government of India for recognition of scientists and technologists for their contributions in the exploration and exploitation of India's mineral wealth.

Dr A. Lahiri, Director, Central Fuel Research Institute, Dhanbad has been awarded the H.K. Sen Memorial Medal for 1969 by the Institution of Chemists (India). The award is made annually to an industrial chemist.

DOCTORATES

Shri Chanan Singh, CDRI, Lucknow — Ph.D. (Panjab University); thesis: Some analytical and biochemical aspects of interaction of biologically important polyanion, polycation and simpler compounds and oscillopolarographic behaviour of some of them (Guide: Dr C.R. Krishna Murti).

Shri L.V. Kannan, CDRI, Lucknow — Ph.D. (Banaras Hindu University); thesis: Biochemical studies of actinomycetes with reference to antibiotics (Guide: Dr V.C. Vora).

Shri S.C. Banerjee, CMRS, Dhanbad — D.Phil. (Calcutta University); thesis: Spontaneous combustion of coal (Guide: Dr R.N. Chakravorty).

Shri M.S. Islam, CMRS, Dhanbad — D. Phil. (Calcutta University); thesis: Lung function tests — their application in health and disease with special reference to certain occupations (Guide: Dr M.K. Chakravorty).

Shri S. B. Nerali, NCL, Poona — Ph.D. (Poona University); thesis: Terpenoids — chemical investigation on terpenic constituents of Cyperus scariosus (Guide: Dr K.K. Chakravarti).

PATENTS

Filed

118187: A process for prepara
tion of raisins from Pusa seedle
variety of grapes, L. B. Singh
O. S. Sharma —NBG, Lucknow.

118256: Improvements in
relating to electrolytes for t
electrochemical marking on metal
S. Guruswamy —CECRI, Karaikud

Accepted

107058: An improved load ce
K. G. R. Jain & D. D. Sahdev —CBR
Roorkee.

Sealed

98144: Suspension type conve
gence indicator, Bhagwant Singh
CMRS, Dhanbad.

98145: Improved type conve
gence recorder, Bhagwant Singh
K.N. Sinha —CMRS, Dhanbad.

98152: A new composition
dye-penetrants containing ind
genous materials for surface a
sub-surface crack detection, S.
Nanjunda Swamy —CMERI, Durgap

98158: Improvements in
relating to alkaline manganese d
oxide wet cells, M.A.V. Devanatha
N. Ramasamy & S. Venkatesan
CECRI, Karaikudi.

101628: Detinning of tin scra
in inhibitor impregnated acid m
dium, N. Venkatakrishnan, R.
Seth & P.N. Mathur — CECR
Karaikudi.

101630: A process for the pr
duction of pure aromatics such
benzene, toluene, xylenes, nap
thalene, etc. from pure and mix
alkylaromatic feeds with or witho
saturates, K.K. Bhattacharyya,
Desikan & L.C. Jain —IIP, Deh
Dun.

101925: Improvements in
relating to the chemical polishing
copper and its alloys, B.A. Shen
(Miss) S. Gowri & (Miss) K.S.
Indira —CECRI, Karaikudi.

SUPPLEMENT TO GLOSSARY OF INDIAN MEDICINAL PLANTS

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CSIR NEWS

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PHARMACEUTICALS AND DRUGS RESEARCH

P & D Committee's Work : 1968

The Pharmaceuticals & Drugs & D) Research Committee had ring the year 8 units and 26 hemes in operation, including 6 nctioned during the year, dealing th the following aspects of drug search: (1) Pharmacological in-stigation of drugs; (2) Pharmaco-gical and microbiological scree-ng of compounds; (3) Clinical ials of new potential drugs; (4) hemical and pharmacological in-estigations of Indian medicinal ants; (5) Synthesis of new drugs;) Studies on antibiotics; and (7) tandardization of processes for harmaceutical industries. Nine chemes were concluded during the ear.

During the year, fifty research apers were published by various vestigators holding P & D Research Committee's grant. As any as 1295 new compounds ere evaluated for their biological ctivity in different centres organi-ed by the committee for screening new compounds.

linical Trials

In a clinical trial of methaqua-ne in the management of tetanus ses, it has been found that the ug had no effect in mild and evere cases while in moderate ses there was some increase of rvivals. In a clinical trial of omazine in 13 cases of cardiac rhythmias, only 3 cases reverted sinus rhythm.

In a clinical trial of Uniferron F, 15 out of 20 patients showed good response, while with Uniferron, six out of seven patients showed good improvement. Almost all the patients complained of pain at the site of injection but none had staining of skin. In a clinical trial of UCB 1402, a new bronchodilator, only four out of twelve cases showed favourable response. In a clinical trial of propranolol as a local anaesthetic in patients with lacerated injuries and those of ENT surgery, good response was noticed in almost all the cases studied. (Dr K. P. Bhargawa, King George's Medical College, Lucknow).

Pharmacological Screening

In a study of the role of catecholamines, 5-hydroxytryptamine and acetylcholine in vomiting in dogs it has been found that neither of these agents is concerned with emesis produced by apomorphine. (Dr K. P. Bhargawa, King George's Medical College, Lucknow).

In a study of the effect of coffee and caffeine on serum lipids in pigs, there was a slight decrease in cholesterol level, but a marked rise in free fatty acids and triglycerides. The rise was more with coffee than with caffeine, thus indicating that coffee may have hyperlipemic agents besides caffeine. A pig heart-lung preparation has been developed for testing of drugs acting on the cardiovascular system. In a study of the subcellular distribution of quinidine in rat heart it has been found that its major concentration is in nuclei and sarcosomes. Heraclenin, a new furocoumarin isolated from *H. candicans*, has been found to possess significant anticoagulant activity in rabbits, being almost as active as tromexan. Petroleum ether soluble fraction of *Curcuma longa* has been found to possess significant anti-inflammatory activity. (Dr R.B. Arora, All India Institute of Medical Sciences, New Delhi).

Propranolol, dichloroisoprenaline (DCI), d-, dl- and l-N-isopropyl-p-nitrophenylethanolamine (INPEA) blocked the contractile responses of the rabbit aortic strip to adrenaline and/or noradrenaline. Propranolol blocked the contractile responses of the rabbit aortic strip to methoxamine. DCI and propranolol did not alter the responses to 5-hydroxytryptamine, angiotensin or acetylcholine but blocked the responses to histamine. Propranolol and INPEA blocked the responses to 5-hydroxytryptamine and histamine but did not affect responses to angiotensin and potentiated those to acetylcholine. Antagonism of the excitatory effects of adrenaline and noradrenaline by propranolol, dichloroisoprenaline and INPEA and that of methoxamine by propranolol fulfilled the conditions of competitive antagonism. Antagonism by propranolol of the excitatory effects of histamine did not fulfil the conditions of competitive antagonism. (Dr O. D. Gulati, Medical College, Baroda).

A study of the metabolism of coumarins, chromones and xanthones in animals has been under investigation. 7-Hydroxy-2, 2-dimethylchromanone appears to be converted to the corresponding chromene. From the urine of rabbits fed magniferin, euxanthic acid has been isolated, thus showing that C-C linked sugar is hydrolysed in the metabolism of magniferin.

Acid soluble fraction of L. Stoechas has been shown to possess significant respiratonic action, which was evident against both barbiturate and morphine depressed respiration. A crude coumarin fraction from P. grandi was found to protect rabbits against death by pentobarbiturate and morphine. (Dr M.S.Y. Khan, Institute of History of Medicine and Medical Research, New Delhi).

Synthesis & Evaluation of Organic Compounds

A series of 3-alkyl-4-oxo-thiazolin-2-yl-hydrazones and 2-methyl-6-halo-3-[p-(2-hydroxy-3,5-dichlorobenzidine) aminophenyl]-4-quinazolones have been synthesized and submitted through a primary pharmacological screen and for certain specialized CNS tests. None of the compounds showed a significant order of activity, which would warrant detailed study.

5-(1-Naphthoxymethyl)-2-oxazolidinethione and 5-(2-naphthoxymethyl)-2-oxazolidinethione have been prepared starting from 3-(2 & 1-naphthoxy)-1,2-epoxypropane by treatment with succinimide followed by hydrolysis and treatment with carbon disulphide of the amino alcohol so derived. (Dr A.K. Barua, Bose Institute, Calcutta 9).

A series of substituted benzvlidene-4-chloro-3-sulphamoylacetophenones, 4-alkoxy-α-ethylcinnamine acids and their amides, 2-substituted-7-chloro-6-sulphamoylquinoline-4-carboxylic acids, 2-(4-chloro-3-sulphamoylphenyl) quinoline-4-carboxylic acid, corresponding amides and N-amidino compounds, and N-amidino substituted benzamides have been synthesized and tested for their diuretic activity; only N-amidino substituted benzamides showed good diuretic activity. (Dr C.V. Deliwala, Haffkine Institute, Bombay 12).

A number of 1-methyl-1-(p-methoxyphenyl)-3-substituted-1-dialkylamino-3-pentanols and corresponding 1,2-Δ-pentanols have been synthesized from the corresponding pentanones by Grignard reaction as potential local anaesthetics. (Dr R.A. Kulkarni, Ramnarain Ruia College, Bombay 19).

A number of N-S-triazinopiperazines and pyrimidinopiperazine, piperazinoethyl quinolines and 2-amino-4-(piperidino/morpholino/N-phenylpiperazino/1,2,3,4-tetrahydroisoquinolyl)-6-chloromethyl-S-triazines have been synthesized and screened for their antifilarial activity in albino rats infected with L. carinii infection. Some of the S-triazinopiperazines have been found to possess significant antimicrofilarial activity.

A series of 1-(p-sulphamoyl)-benzoyl-4-substituted thiasemicarbazides, and the oxadiazoles, thiadiazoles and 5-mercaptotriazoles prepared from them, sulphonamido-S-triazino and some guanylsulphonyl ureas and biguanides were synthesized and screened for their hypoglycemic activity. None of the compounds possessed significant hypoglycaemic activity.

8-Substituted-5,6-benzoketoquinolizines prepared from the appropriately substituted 3,4-dihydroisoquinoline have been found to possess significant anticonvulsant activity. (Dr U.P. Basu, 23/3 Gariahat Road, Calcutta 19).

A number of Mannich bases have been prepared from chromanones, thiochromanone, 3-N-arylrhodamines, 2-arylimino-4-thiazolidones, 2,3-dihydro-4(IH)-quinolones, using morpholine, piperidine and diethylamine as bases, as potential antispasmodics.

A number of 4-p-arsonophenyl-N-aryl-2-amino-thiazoles and 4-arylamino-p-arsonophenylthiazoles, and dichloroacetamido derivatives of 3-N-arylrhodamines, chromanones, thiachromanones, chromone-2,4-diene have been prepared, and tested for their antiamoebic activity, but none of the compounds showed significant activity. (Dr M.K. Rout, Department of Chemistry, Ravenshaw College, Cuttack, Orissa).

A number of 2-hexyl-4, -d methoxy-α-methylbenzylamines a their N-alkyl, dialkyl and N-dichl roacetyl derivatives have synthesi ed as potential anti-amoebic agent (Dr B. Pathak, Department of Pha maceutical Chemistry, Universi Colleges of Science and Technolog Calcutta).

A number of 2-(2-amino- thiazolyl) benzothiazoles have be synthesized as potential anthelmi tic agents. (Dr S.N. Sawhney, Kuru shetra University, Kurukshetra).

Methiodides and ethiodides 4-(2-N,N-dimethylaminoethoxy, piperidinoethoxy, 2-pyrrolidin ethoxy, 2-morpholinoethoxy, benzylaminoethoxy, 2-N-methyl- phenylaminoethoxy, 2-o-toludin ethoxy) quinazoline and of 4-(piperidinoethoxy, 2-N-ethyl-N-ph nylaminoethoxy, 2-o-toludinoetho and 2-p-methoxyanilinoethoxy qu noline have been synthesized a found to possess significant hyp tensive activity. (Dr S.M. Des pande, College of Science, Banara Hindu University, Varanasi 5).

With a view to testing the ant cancer activity, a number of amide derived from p-fluoroaniline, aminopyridine and piperazine ha been prepared, as analogues 2-chloro-4', 4"-di-2-imidazolin- yl-terephthalanilide. (Dr R. P. Ra Gorakhpur University, Gorakhpur

In a search for new antivir agents a number of glyoxami oximes have been prepared fro p,p'-diaminodiphenylmethane a different amino benzoic acid These were condensed with 4-(tolyl) thiosemicarbazide and amin guanidine to give the correspondi thiosemicarbazones and quany hydrazones.

Some of the m- and p-carb xylgyloxanilide derivatives we condensed with glycine and methi nine ethyl esters to give the co responding peptide derivatives. (V.S. Misra, Lucknow Universi Lucknow).

Microbiological Screening

Antigenic analysis of some w recognized strains of Salmone typhosa and Vibrio cholera has be carried out, and monospecific se ainst them are being developed. ese strains have been tested for eir amino acid decarboxylase tivity by Mollers and Gale's procedures. (Col. S. S. Bhatnagar, Caius esearch Laboratory, St Xavier's ollege, Bombay).

vestigations on Medicinal Plants

A chemical investigation of epeta hindustana and Selinum nuifolium, reported to be effective coronary thrombosis and aethe- osclerosis, has been made. A ew flavone nepitrin isolated from . hindustana has been shown to be -β-glucoside of 6-methoxy-5, 7, 3', -tetrahydroxyflavone, while from . tenuifolium four crystalline oumarins have been isolated, two which have been identified as '-angeloyloxy-4'-acetoxy-3'-4'-di- ydroseselin and 3', 4'-diangeloy- oxy-3', 4'-dihydroseselin. (Dr T.R. eshadri, Department of Chemistry, niversity of Delhi, Delhi).

Of three glycoalkaloids isolated om Solanum sarattense, two have een shown to be identical with olamargine and solasonine. The ird alkaloid D_5 also contains sola- onine as the aglycone and has D- lucose, D-galactose and L-rham- ose as the sugar moieties. From . vagum, a mixture of glycoalka- oids has been isolated. Solasonine nd D_5 at a dose of 1 mg/kg pro- uced a significant fall of blood ressure in anaesthetized cats hich was not affected by atropine, epyramine, acetylcholine, adrena- ne, histamine, cerotid sinus occlu- ion or spinal transection. If, owever, this dose was given slowly y continuous infusion (2 mg/hr), no all of blood pressure was observed. hese alkaloids had no other strong harmacological action. When ad- inistered to female rats for 15 ays at 5-10 mg/kg, vaginal smears nd ovarian sections were sugges- ve of progestational activity. (Dr . Chatterji, Department of Chemis- ry, Medical College, Calcutta 12).

In a chemical investigation of runus persica (Hindi — Aru; Rosa- eae) and Juniperus macropoda Hindi — Abhal; Cupressaceae) used anthelmintics, hentriacontane, entriacontanol, β-sitosterol and a ew triterpenoid have been isolated from P. persica (leaves), while from J. marcopoda (berries) an essential oil glucoside, a new flavone glycoside, β-sitosterol and sugiol have been isolated. (Dr A. B. Sen, Department of Chemistry, Lucknow University, Lucknow).

Isolation & Screening of Antibiotics

An antibiotic isolated from Thermoactinomyces viridis has been found to be similar to thermoviridin. An antibiotic has been isolated from a strain of Streptomyces thermoviolaceus which is highly active against a number of Gram-positive organisms and pathogenic fungi. Conditions have been standardized for stepping up the yield of this antibiotic. Purified lytic enzymes have been prepared from seven selected cultures and their physico-chemical properties studied. (Dr S.A. Dhala, Department of Microbiology, Bhavan's College, Bombay 58).

Pharmaceutics

In a study of the preparation of new enteric coating materials, stearic acid esters of polyglycerol were prepared using different ratios of the acid to alcohol and their physico-chemical properties and enzymatic hydrolysis studied. It was found that the properties of the esters prepared from 1:3 or 1:5 ratio of alcohol to acid corresponded very closely with those of the commercially used materials. In toxicity studies in albino mice these were found to be safe up to 3 g/kg body weight. [Dr (Mrs) M. R. Baichwal, Department of Chemical Technology, University of Bombay, Bombay 19].

Mathematical Methods in Science and Technology

The Council of Scientific & Industrial Research will be sponsoring conferences, seminars and symposia on 'Mathematical Methods in Science and Technology' (MASTECH) at various centres in India.

Prof. Alladi Ramakrishnan, Director, Institute of Mathematical Sciences, Madras will be the general convener of the series of conferences. He will be assisted by a steering committee appointed separately for each conference.

The following are the objectives of the conferences: (1) to foster original work in mathematical sciences; (2) to bring creative mathematicians into direct contact with the scientists engaged in industry; (3) to stimulate new applications of mathematical methods in various fields varying from biology to industry; and (4) to survey the state of the subject and to discover new topics for research and improve methods for research in progress.

The number of participants for each seminar will be approximately 30; some six of them will be guest lecturers to survey the state of the subject. The lecturers are expected to give comparative and critical accounts of the development in the field in which they have made original contributions.

The participants should present original papers (hitherto unpublished) and are expected to join discussions in the scientific meetings. Those intending to present papers should send them to any of the members of the steering committee.

The first MASTECH conference will be on 'Matrix and Combinatorial Analysis in Science and Technology' at the National Aeronautical Laboratory, Bangalore for three days during August 1969. The actual dates will be announced in due course.

The members of the steering committee for the first conference are: Dr S. R. Valluri, Director, National Aeronautical Laboratory, Bangalore; Prof. G. S. Ramaswamy, Director, Structural Engineering Research Centre, Roorkee; and Prof. J. N. Kapur, Professor of Applied Mathematics, Indian Institute of Technology, Kanpur.

The first conference will be followed by conferences on: numerical analysis; differential equations; stochastic theory and operational research and other subjects.

Chemicals from Coal & Coal Byproducts
CFRI Contribution

Investigations on the utilization of coal and coal byproducts leading to the development of processes for the production of chemicals, fertilizers, adsorbents, water softeners, etc. constitute a major part of the research and development programmes of the Central Fuel Research Institute (CFRI), Dhanbad. The institute has developed processes for a variety of chemicals such as benzaldehyde, benzoic acid, naphthalene, phthalic anhydride, naphthaldehydes (α and β), isonicotinic acid, nicotinic acid, 4-cyanopyridine, anthracene, phenanthrene, carbazole, isomerization of m-xylene to o and p compounds and resins and hardboards.

Benzaldehyde

Benzaldehyde prepared by hydrolysis of chlorinated toluene is unsuitable for use as preservative since it is contaminated with chlorine. For the production of chlorine-free organic intermediate used in the manufacture of dyes, pharmaceuticals, fine chemicals, perfumeries and in beverage processing, CFRI has developed a process utilizing toluene, a constituent of coke oven benzol and petroleum naphtha. The process employs catalytic vapour phase oxidation of toluene with air. The reaction products are collected in a number of condensing systems. The bulk of the unconverted toluene coming out with the air stream is isolated either by refrigeration or by adsorption in two columns of active charcoal alternately used. The toluene recovered is recycled. Starting with 100 g of toluene, 72.6 g of benzaldehyde are obtained.

The catalyst for the process has been developed by the institute. The process does not involve the use of expensive oxidizing agents, is continuous and gives a chlorine-free product of sufficient purity. In view of the surplus production of toluene, the process may prove to be a profitable avenue for its utilization.

Laboratory scale investigations have been completed. Pilot plant trials are planned for obtaining design data for commercial plants.

Benzoic Acid

This chemical, which can be prepared from toluene, is used in pharmaceutical, plastic and dyestuff industries. It is also used in the manufacture of adhesives, surgical tapes, rubber latex, soap and in food preservation and tobacco curing. The existing processes are uneconomic and the product is generally contaminated with undesirable compounds or batch ones often requiring at the same time costly oxidizing agents, which are mostly imported.

The process developed by CFRI is simple and adopts oxidation of toluene with air or oxygen-enriched air under specified conditions. The reaction product is collected in an air-cooled condenser and the unreacted toluene, after isolation is recycled. The yields per 100 g of toluene are 104 and 75 g of benzoic acid for oxygen-enriched air and air respectively. This process has none of the drawbacks of the existing processes. Laboratory scale experiments have been completed and pilot plant experiments are planned for obtaining design data for commercial plants.

Isomerization of Xylenes

Of the xylene isomers present in coal tar, ortho and para isomers are more in demand than the meta form. The first two isomers are required for the production of terephthalic acid, an intermediate for the manufacture of polyester fibres, Terylene, Dacron, Terene, etc. and phthalic acid for synthetic resin and dyestuff industry. However, the feed-stocks available to the chemical industry are mixtures of the three isomeric xylenes. Hence a method was developed at CFRI for conversion of m-xylene into its useful isomers. The process consists of vapour phase catalytic isomerization of 'xylene cu obtainable from crude tar. Th product is collected and cooled a liquid. p-Xylene is separated a solid by flash refrigeration an o-xylene by fractional distillatio leaving behind m-xylene for furthe conversion. The concentrations o p- and o-isomers can be increase to 22 and 21 per cent respectivel from a low value by this process The product is free from ethylbenzene. Thermal cracking of th feed-stock into carbon and hydroge and other gases is low, the tota proportion of feed-stock thus destroyed being well below 5 per cent Although small quantities of trimethylbenzene and toluene ar present in some runs their conten is below 5 per cent.

Pilot plant trials have bee planned for obtaining data for commercial scale plants.

Naphthalene and Phthalic Anhydride

Naphthalene is required for th manufacture of phthalic anhydride an intermediate for dyestuff, plasti and resin industries, and for preparation of moth balls. For bot these uses, naphthalene of hig purity is required. The indigenously available naphthalene (91 97% purity) does not meet th growing needs of the industry.

For purifying, CFRI proces takes recourse to crystallization the pure variety from a solution the impure variety in organic solvents. Crude naphthalene oil fraction of raw tar can also be treate to yield pure naphthalene by thi process. The process is ready fo release to industry.

The institute has developed a economic method for the productio of phthalic anhydride by catalyt oxidation of neutral tar oil in fluid bed. The advantage of the process is that it eliminates the use pure naphthalene used in the conventional process. Investigation are being continued in a pilot pla of 125 kg/day capacity.

sin and Hardboards

The tar acid fraction of crude r, a byproduct of coal carboniza- on, is suitable for the production resin which can be used for bond- g industrial wastes like bagasse, te waste, cotton waste, saw dust, od shavings, etc. to form hard- ards widely used for ceilings, rtitions, table tops and a variety other interior decorations.

A 1-tonne/charge tar distilla- on plant has been installed at FRI and different solvents have een tried for the extraction of tar id from specific fractions as the nventional alkali extraction has rtain limitations. Aqueous am- onia has been found to have some lectivity with regard to the ex- action of phenol, a component of r acid fraction.

The resin preparation by the FRI process follows the well- own condensation reaction bet- een tar acid mixture and formal- hyde. The process has been eleased to Durgapur Projects Ltd, alcutta.

For hardboard preparation FRI has developed two processes. one of the processes the waste aterial is intimately mixed with e resin in aqueous alkali. The sin is precipitated by adding acid d the mass is washed acid-free r subsequent processing. In the cond process, the waste materials e soaked in water and put into sin solution, dried and hot essed. This process eliminates resin precipitation stage as ll as the subsequent washing pro- ss.

The capital outlay for a plant pable of producing 1224 tonnes of rdboards (90 000 sheets of 244 x 2 x 0.3 cm) per annum is esti- ted at about Rs 6 lakhs.

and β-Naphthaldehydes

These chemicals are used in pharmaceutical, fine chemicals, agricultural industry. The ex- ing methods of manufacture of se chemicals are uneconomical entail the import of oxidizing agents. Moreover, they are unsuitable for large scale operation.

HARDBOARDS FROM INDUSTRIAL WASTES: From tar acid fraction of crude tar, CFRI, Dhanbad has prepared a resin binder which can be used for bonding industrial wastes. Samples of hardboards prepared at the institute utilizing mica waste, saw dust, asbestos waste, jute waste, coal ash, coconut pitch, 'katha' residue, etc. are seen

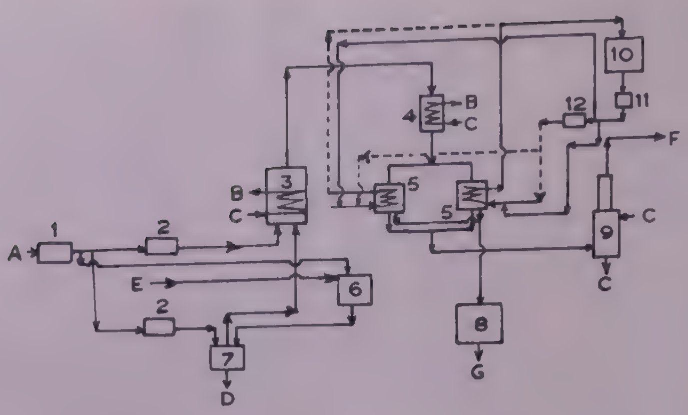
The novelty of CFRI invention lies in the utilization of cheap tar oils which contain abundant amounts of α- and β-methylnaphthalenes. The tar oil fraction is catalytically oxidized with air in the vapour phase, thus eliminating the need for expensive oxidizing agents and enabling continuous operation. For the recovery of α-naphthaldehyde, the reaction product containing phthalic anhydride, unreacted feed and α-naphthaldehyde is first cooled in condensers. On extracting the condensate with hot water, phthalic anhydride goes into solution leaving behind a binary mixture of the other two. The mixture is treated with a 1:1 mixture of methyl alcohol and water when α-naphthaldehyde completely goes into solution and is subsequently recovered by distillation. The unreacted α-methylnaphthalene is recycled for further conversion. Starting from 100 g of α-methylnaphthalene 42.9 g of naphthaldehyde and 13.2 g of phthalic anhydride can be obtained.

In the case of β-naphthaldehyde, the binary residue consisting of β-naphthaldehyde and β-methylnaphthalene is subjected to azeotropic distillation when β-methylnaphthalene distils over leaving behind β-naphthaldehyde. The β-methylnaphthalene is recycled. Starting from 100 g of β-methylnaphthalene 34 g of β-naphthaldehyde and 40 g of phthalic anhydride can be obtained.

Nicotinic Acid, Isonicotinic Acid and 4-Cyanopyridine

Nicotinic acid, an ingredient of vitamin B, is generally prepared from pure β-picoline. Isonicotinic acid and 4-cyanopyridine are intermediates in the manufacture of tubercular drugs. These are prepared from pure γ-picoline after separation and purification of the picolines from their mixture with 2,6-lutidine. The mixture, known as 'β-picoline cut', is at present imported and the method of separation of the picolines is laborious.

The institute has worked out a process for the isolation of isonicotinic and nicotinic acids from the mixture of pyridine carboxylic acid, based on the difference in their solubilities in alcohol and aqueous



FLOWSHEET OF ANTHRAQUINONE PILOT PLANT: 1 air compressor 2 air preheater 3 catalytic reactor (fluid bed) 4 desuperheater 5 solids condenser 6 anthracene storage tank 7 carburettor 8 crude anthraquinone storage tank 9 scrubber 10 oil storage tank 11 oil pump 12 oil heater [A air B steam C water D drain E feed anthracene F atmosphere G crude anthraquinone]

acetone. The finely powdered mixture is leached with cold ethanol when most of the nicotinic acid and picolinic acid goes into solution. The residue consisting of isonicotinic and dipicolinic acids is refluxed with aqueous acetone in which dipicolinic acid completely goes into solution. The aqueous insoluble part is pure isonicotinic acid. The solid portion obtained on evaporation of alcoholic and acetone solution is heated to 350°C when nicotinic acid together with pyridine is obtained. The solid is washed with ether or benzene and crystallized to give pure nicotinic acid in 80-85 per cent yield.

The transformation of γ-picoline to 4-cyanopyridine is carried out by catalytic reaction with air and ammonia in a reactor. The reaction products are collected in a suitable condensing system, while unreacted material is isolated by refrigeration and recycled. The conversion per pass is 65 per cent, but with recycling of the unreacted feed, the production corresponds to 85 g of the 4-cyanopyridine for every 100 g of γ-picoline charged. The product thus formed is pure. Techno-economic feasibility studies for commercial adoption of the process are under progress.

Anthracene, Phenanthrene and Carbazole

Anthracene is an important intermediate for the synthesis of anthraquinone used by the dyestuff industry. Phenanthrene and carbazole are the starting materials for synthesis of resins and agricultural chemicals. In the absence of adequate arrangement for recovery and isolation of the individual compounds, a part of the crude 'cake' containing all the compounds is burnt away and a part is used for the production of carbon black. The institute has developed a process for separating the chemicals from the crude cake. The process consists in dissolving the anthracene cake or the anthracene containing fraction in a solvent by heating to about 115°C, the feed solvent ratio being so adjusted as to get a solution almost saturated with respect to anthracene and then gradually cooling the mixture to 50°C or lower temperature to effect crystallization of anthracene. The degree of purity obtained depends on the initial anthracene content. Starting with an anthracene part containing 20 per cent anthracene, it is possible to obtain a product containing 85-87 per cent anthracene with anthracene recovery of about 90 per cent in one step. In another step of crystallization using this product and the same solvent, a product containing anthracene of 93-96 per cent purity may be obtained. The mother liquor is fractionated to obtain phenanthrene leaving behind carbazole-rich fraction.

Pure anthracene (90-95% purity), as obtained above, can then be utilized for the production of anthraquinone. The anthracene is
vaporized, mixed with air a
passed over a catalyst developed
CFRI. The oxidation product co
tains 90-92 per cent anthraquinon
This is purified to obtain anthra
quinone of more than 99 per ce
purity. The yield of anthraquino
is 80-90 per cent based on t
anthracene content of the feed.

All the processes are cover
by patent rights. Parties interest
in the commercial utilization of t
processes may correspond with t
Secretary, National Research D
velopment Corporation of Indi
Mandi House, Lytton Road, Ne
Delhi 1.

WHO Regional Reference Centre on Air Pollution

The Central Public Heal
Engineering Research Institu
(CPHERI), Nagpur has been desi
nated by the World Health Organ
zation as WHO Regional Referen
Centre on Air Pollution fro
January 1969 for a period of fi
years. The functions of the R
gional Centre are: (1) to colle
and evaluate data on air polluti
trends in India and other countri
of the region; (2) to initiate,
collaboration with national inst
tutions, systematic air polluti
programmes, using uniform metho
of survey, design and measur
ment and to provide advice a
consultation services on metho
of air pollution control; (3) to car
out research on behalf of the WH
International Reference Centre
air pollution; (4) to assist in t
collection and exchange of scienti
and technical information on a
pollution; (5) to assist in traini
staff needed in air pollution pr
grammes and in organizing natio
and regional training courses in
principles and methods of air poll
tion control; and (6) to act as
liaison laboratory between the n
tional institutions in the region a
the International Reference Cent
on Air Pollution.

The division of Industrial H
giene and Air Pollution of CPHE
has been particularly interested
ambient air pollution studies
industrial areas. The equipment
monitoring air pollutants, made fr
locally available materials, h
been designed and constructed.

Process for Recovery of Metallic Fines and Design of Kiln for Burning Limestone Ready for Commercial Utilization

ecovery of Metallic Fines

During melting, casting, ma- ining, powdering, etc. of metals ıd metal parts, losses of metal ccur in the shape of dross, fines, varf, etc. Losses increase with e metals which are easily sus- eptible to oxidation. It is difficult obtain good recovery as the aterial gets finer in particle size.

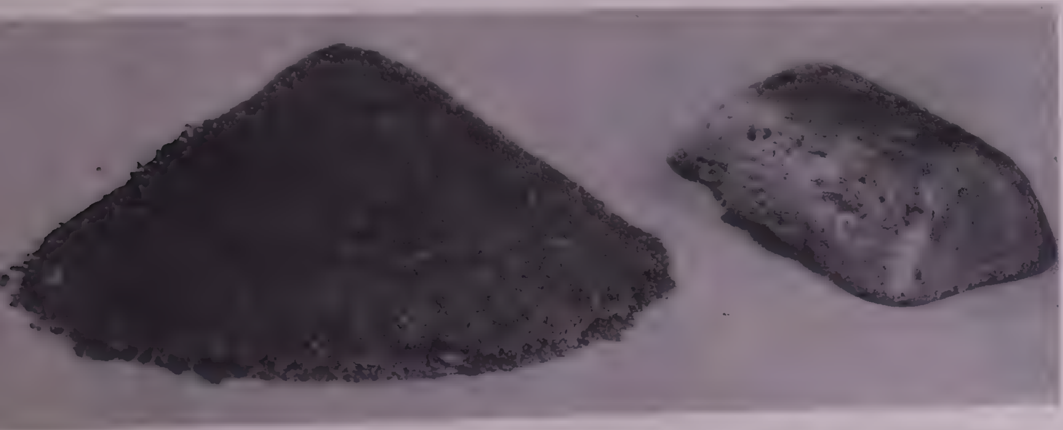
Metallic values from dross, nes, and metallic waste fines owadays are recovered by melting. ther methods in vogue are: (1) ddition of the fines into the molten ool of the respective metal; (2) riquetting of the fines with or ithout binders and adding into a olten pool; (3) briquetting of the nes with the addition of binder nd/or flux and adding into the olten pool; and (4) melting of the nes inside a rotary type furnace. etallic recoveries in all these ethods are poor and the processes ot economical.

The National Metallurgical aboratory (NML), Jamshedpur has eveloped a process for the re- overy of metallic fines, which is rgely applicable to various metal- c fines. The process consists in e melting of the fines under such onditions that the fine metallic articles come into contact with ach other with their freshly ex- osed metallic surfaces to coalesce form a homogeneous pool of molten metal. The recovery of metallic fines by this process is in a usable form such as pig, ingot or lump shape.

The process has been successfully employed for recovering zinc from zinc fines (zinc dust, shavings and blowings) and aluminium from aluminium dross and oxidized aluminium powder. The product has been found acceptable to consumers provided the fines are not originally contaminated with impurities.

The main raw materials required for the recovery of the metallic fines are fluxes of aluminium, copper, brass and zinc when fines of the respective metals are to be reclaimed. All are available in the country. The essential equipment consists of melting pot, furnace, and pouring and casting units. These can be fabricated in the country.

The capital cost for setting up a unit capable of treating 100-250 kg of sample per batch is estimated at Rs 20 000 to 30 000. The cost of processing varies from sample to sample and is estimated at 50-75 paise per kg of reclaimed metal.



ALUMINIUM FROM METAL FINES: For recovering metallic values from dross, fines, etc. NML, Jamshedpur has developed a process of melting the fines when they coalesce to form a lump under suitable conditions. Aluminium recovered in lump form from the metal fines is seen

Improved Burning of Limestones

Lime burning is mostly practised in India in country-type rectangular kilns known as 'bhattis'. The drawbacks of such kilns are that there is wastage of heat and the lime produced is not of uniform quality, being overburnt and underburnt in different pockets of the kiln. Moreover, these kilns cannot be used for burning under controlled conditions as are required for burning limestone.

A kiln, which is amenable to much better controls and having high thermal efficiency, has been designed and built by the Central Building Research Institute (CBRI), Roorkee. The kiln has been successfully used for burning magnesian and dolomitic limes at stipulated temperatures. The kiln has also been found suitable for burning high-calcium and chemical grade limes.

KILN FOR BURNING LIMESTONE: Designed and built by CBRI, Roorkee, this kiln of improved design is meant for burning high-calcium limestones, magnesian and dolomitic limestones and for producing chemical grade and special type of limes. The new kiln has several advantages over the conventional kilns in regard to the control of burning conditions, product quality and thermal efficiency

A brick-masonry structure, the kiln has several advantages over the conventional 'bhattis'. Its design ensures both smooth running of the kiln and periodic withdrawal of lime and lends itself to a fair degree of instrumentation. It works on natural draft with provision for controlling the draft. Although it works continuously, it can be adopted for day working only. Heat losses are minimum, and uniform quality lime with little core or unburnt material is obtained. Contamination of burnt lime with fuel is minimized.

Steel, chemical, paper and sugar and other industries use the bulk of high-calcium limestones and hence the building industry will have to depend in future upon dolomitic limestones. The latter cannot be burnt in the existing rectangular kilns and special type of kilns will be required for this purpose. The newly designed kiln will be most suitable for burning dolomitic limestone.

A small scale kiln has been designed and installed at CBRI. It has been run for periods lasting over a week, a number of times, in order to know the operational factors. The kiln can also be scaled for larger production.

The cost of kiln construction is about Rs 6,500 including the cost of accessories such as chimney and dampers. It burns about ten tonnes of limestones in 24 hours.

A scheme for instrumentation is being worked out at the institute and with the incorporation of instrumentation the kiln will provide better control of kiln operation.

Full technical know-how and construction details and specifications will be available to the licensee.

Parties interested in undertaking the commercial development of the process for recovery of metallic fines as also of the know-how for the kiln may correspond with the Secretary, National Research Development Corporation of India, Mandi House, Lytton Road, New Delhi 1.

Recruitment to CSIR Scientists Pool

Applications are invited by CSIR from persons with outstanding academic qualifications (doctorate degree in science, technology, social science or humanities or a master's degree in engineering or medicine) for the next selection to Scientists Pool. The Pool offers: assignment in an appropriate institution; a salary between Rs 400 and 700 per month plus allowances (higher salary in exceptional cases); and freedom to apply for positions anywhere and to leave the Pool at short notice.

Pool placement is not a regular appointment, but is a facility to enable well qualified persons to work while looking for regular positions. The temporary placement in the Pool is generally for a period of one or two years.

Prescribed application forms are obtainable from the Secretary, Council of Scientific & Industrial Research (DSTP), Rafi Marg, New Delhi 1. Completed forms should reach him by 10 June 1969.

C. S. Bhandary

CPHERI COURSE ON WATER ANALYSIS

A two-month course on Water and Waste Water Analysis will be conducted by the Central Public Health Engineering Research Institute (CPHERI), Nagpur from 4 Aug. to 26 Sept. 1969. The course is intended for B.Sc. degree (chemistry) holders and employed in the operation of water, sewage and industrial waste treatment plants. The course will be mainly concerned with the theoretical and practical aspects of laboratory analytical work, and will include subjects like sanitary chemistry, microbiology, water and sewage treatment. The candidates will also participate in seminars and prepare term papers.

Application forms and details of syllabus may be obtained from the Director, Central Public Health Engineering Research Institute, Nehru Marg, Nagpur 3, and applications should be sent so as to reach him before 20 June 1969.

INDUSTRIAL FUELS AND LUBRICANTS

IIP SHORT-TERM COURSE

The course, conducted by t Indian Institute of Petroleum (III Dehra Dun, is intended for combu tion fuel efficiency engineers a for practising engineers in industr It is of a month's duration starti in June 1969.

The course will cover t following aspects: (1) basic concep of friction, wear and lubricatio (2) petroleum based fuels, lubr cants, and grease manufacture; (fuels for industrial power plan and furnaces; and (4) selection lubricants and problems of lubrica tion in various industrial applica tions. The participating staff wi comprise senior engineers from th institute and specialists from c companies, industry, universiti and some technological institution Visits to some industrial establish ments are also scheduled.

Further information and appli cation forms are obtainable fro the Scientist-in-charge, Trainin Division, Indian Institute of Petro leum, Dehra Dun.

PATENTS

Filed

118326: A new class of solve for separation of pure aromatics o olefins, S. K. Ghosh — IIP, Dehra Du

118359: A modified proce for producing copolymers of acry lonitrile, butadiene and styren S. P. Luthra, B. K. Patnaik & R. Thampy — SRIFIR, Delhi.

118475: A mango segmen peeler, J.L. D'Mello & V.M. Kudal — CFTRI, Mysore.

Accepted

104389: Modified expansic shell type roof bolt, B. Singh & B. Verma — CMRS. Dhanbad.

105271: Process for retainir unsaturation during conversion partially epoxidized glycerides ar esters to corresponding monohy droxy compounds, K. T. Achaya & Subbarao — RRL, Hyderabad.

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RARY

PROGRESS OF RESEARCH UNDER CHEMICAL RESEARCH COMMITTEE : 1968

Chemical Research Committee, ch is one of the most important largest research committees of R, had during the year under iew about 250 research schemes operation. Some 10 retired entists' schemes were also in ration during the year. The mittee held two meetings and a vention.

A summary of the progress of earches under the purview of the mittee in organic chemistry, sical and inorganic chemistry biochemistry is given in the owing paras.

GANIC CHEMISTRY

ves of *Chloroxylon swietenia* ished a new furanocoumarin, tenin, which has been found to he first example of a 3-substi- d furanocoumarin having no gen function at C-4. The cons- ion of Putranjivadione, a triter- oid isolated from *Putranjiva urghii*, has been established as dlan-3, 7-dione by chemical de- dations and by physical methods.

In the investigations of woods barks, a new substance isolated n *Croton oblongifolius*, has been ied and found to be a new diter- alcohol (oblongifoliol) and its cture including the stereo- mistry has been established. nded sal tree attracts borers h breed in the wood and des- it. Chemical examination of resin, a product coming from wounded areas was carried out a mixture of terpenoids has isolated. During the course he chemical study of *Lobaria* ns, the species *Lobaria reti-* yielded a pentacyclic triterpene, retigeradiol and its structure has been established as 3β, 19β-dihydroxytaraxerane.

Some exploratory experiments have been carried out with a view to synthesizing oosponol, an isocoumarin derivative isolated from the culture filtrate of *Oospora astringene*. Self-condensation of anthranilic acid, not studied so far, leads to the formation of trimer and tetramer of anthranilic acid. The constitutions of the products have been settled from spectral studies.

A large number of flavono-7, 8-isoxazoles and 7, 8-oxazoles were synthesized as some of them are naturally occurring and possess physiological properties.

The action of Raney nickel on various steroids brings about oxidation of 3-hydroxyl groups and saturation of the 5, 6-double bond. The studies have been extended to triterpenoids. A new triterpene has been obtained from the bark of *Artocarpus chaplasha* and has been named as isocycloartenol. It is shown to be cycloart-25-enol or 9, 19-cyclolanost-25-en-3β-ol. The chemical study of rubusic acid, a constituent of the plant *Rubus moluccanus* has led to its structure as 7-hydroxyoleanolic acid.

A linear dihydrofurano isocoumarin glucoside, Blepharin has been obtained from the seeds of *Blepharis edulis*. Both the glucoside and its aglucone have been studied.

Reticulol, a new metabolic isocoumarin produced from *Streptomyces rubrireticuli*, has earlier been shown to be 6, 8-dihydroxy-7-methoxy-3-methylisocoumarin. Starting from 5, 6, 7-trimethoxyindanone, the (±)-O-methyl ether of reticulol has been synthesised.

Two benzoquinone derivatives were isolated from Maesa *macrophylla*. One of them has the structure of 2, 5-dihydroxy-3-methyl-6-*n*-nonyl-1, 4-benzoquinone and this has been confirmed by its synthesis from 2, 5-dihydroxytoluquinone. A synthesis of 3, 9-dimethylchrysene has been developed starting from ethyl-4-(β-naphthyl) valerate through its octahydro derivative. A new synthetic method has also been devised for the hydrocarbons 2-methyl- and 3-methyltetraphenes.

PHYSICAL AND INORGANIC CHEMISTRY

Solvent extraction of different metals has been done using mesityl oxide, tributyl phosphate, etc. For the identification of metal cations on thin layer chromatography, potassium thiocarbonate has been successfully used as spray reagent. Complexes formed between metals and hydroxytriazene give a strong ligand field. Several compounds of rhodium and irridium with ethyldiphenyl arsine having general formula $MX_2H\ (AsEtPh_2)_3$ were prepared, where M and X are metals and halogen respectively. A number of metal ions react with 3, 5 dimethylpyrazole and 3-methylpyrazole-5-carboxylic acid to give complexes and these have been isolated and characterized. Different types of organo uranium compounds have been prepared starting from uranium pentaethoxide. Triazene-1-oxide yields a complex with cobalt, which is shown to possess trans configuration. PMR contact shift of pyridine and substituted pyridine coordinated to nickel chelates indicated positive spin density in σ-orbital of pyridine.

Kinetics and mechanisms of several oxidative processes have been studied. Iodine bromide has been shown to be a powerful catalyst in the bromination of anisole.

A two-structure model of strong electrolytes has been proposed in which a Debye ion-cloud and a quasi-lattice of ions are the two significant structures and after introducing a concentration dependent partition function to weight them, an equation for the activity coefficient has been developed which predicts experimental data up to a concentration of 4.0 *M*. A red photoproduct of octacyano molybdic acid has been characterized and isolated as silver salt. The Debye-Huckel-Onsagar equations were found to hold for solutions of tetra-alkyl ammonium iodides in N-methyl acetamide and N-methyl propionamide. Heats of solution of alkali halides and alkaline earth halides have been determined using isothermal phase change calorimeter.

A static type equilibrium still and a transistorized long duration microcalorimeter have been fabricated for accurate measurement of excess free energy and heat of polymer solutions. Partial molar volume and dipole moment of chloroform in aromatic hydrocarbons have been estimated and interpreted in terms of specific interaction between the two compounds. Structured charge transfer bands have been found in anthracene tetrahalo-*p*-benzoquinone complexes in chloroform. Low temperature polarized crystal spectrum of $K_3Cr(CN)_6$ revealed weak sharp lines around 5300A due to ^4A-$^2T_{2g}$ transition.

BIOCHEMISTRY

In a research scheme being worked at the Christian Medical College and Hospital, Vellore, a new method for the estimation of monoamine oxidase has been standardized using kynurenine as substrate. The level of alkaline phosphatase in the intestinal mucosa of sprue subjects and patients suffering from giardosis and lymphoma of the intestine has been found to be lower than that in normal subjects. A significant elevation in the urinary hydroxyproline has been observed in tropical sprue and various types of leprosy. L-Hydroxyproline has been shown to be present as a protein constituent in the leaves of *Santalum album* Linn. (Dr A.N. Radhakrishnan, Christian Medical College and Hospital, Vellore).

Researches at the Biochemistry Department of the Calcutta University have shown that administration of carcinogens such as 3-methylcholanthrene and narcotics such as chlorobutol causes elevation in the urinary excretion of L-ascorbic acid in rats. The mechanism by which this is effected is being investigated. Many birds, especially the red vented bulbul, have been found to be incapable of synthesizing L-ascorbic acid. This has been correlated with the absence of the enzyme L-gulono oxidase in them. The results indicate that in the branched evolution of birds in the phylogenetic scale the enzyme originally resided in the kidney, then passed on to liver, and finally disappeared from the liver in evolved birds like the bulbul. (Dr I. B. Chatterjee, Department of Biochemistry, Calcutta University, Calcutta 19).

Two organisms isolated from the soil, B_4(gl) and $A_{10}S$, produce glutamic acid and alanine in high yields. A mutant P III of *Streptomyces fradiae* produces large quantities of the antibiotic neomycin B, of the order of 600 μg/ml. (Dr S. K. Majumdar, Department of Food Technology and Biochemical Engineering, Jadavpur University, Calcutta 32).

A soluble RNA-dependent polyribonucleotide synthesizing enzyme has been detected and purified from extracts of *Azotobacter vinelandii*. Another enzyme which incorporates guanylate residues into DNA at a rate much faster than that of other nucleotides, has also been purified from the same organism. The product appears to be guanylyl DNA. Four RNases degrading single stranded RNA have been detected in *Salmonella typhimurium*. Of these, RNase I has been purified 140-fold which has been shown to be an endonuclease. The ultimate product of the reaction with poly A as substrate is 2', 3'-AMP. Another phosphodiesterase, also specific for RNA, has been purified from phage-infected *Sa* *monella*. It has been found to be exonuclease, and the product is 5 AMP with poly A as substrat Studies have been carried out phage multiplication in penicill spheroplasts of *Salmonella*. (D D.P. Burma, Department of Bi chemistry and Biophysics, Banar Hindu University, Varanasi-5).

Studies have been carried o on the regulation of heme biosy thesis in *Neurospora crassa*. T second enzyme of this pathway, δ aminolevulate dehydrase is induc by iron, and repressed by prot porphyrin, the penultimate en product of this pathway. A prote inhibitor for δ-ALA dehydrase h been detected in *Neurospo* extracts. The first enzyme in t pathway of reduction of nitrat nitrate reductase, is repressed amino acids, which are the imm diate end-products of nitrate redu tion. in *Neurospora*. The inte relationship between iron a nitrate metabolism in *Neurospo* has been investigated.

The mechanism of action of N-oxalyl-L-α, β-diaminopropion acid (ODAP) isolated from the pul *Lens sativus*, which causes t crippling disease neurolathyris has been investigated. Administr tion of this compound into you rats results in the accumulation glutamine in the brain, formed pr sumably by the trapping of ammon produced by the action of the neur toxin. The biosynthetic pathway ODAP in the *L. sativus* plant h been elucidated. The steps invol oxalyl activation yielding oxa CoA and condensation of oxalyl C with diaminopropionic acid to gi ODAP. (Dr P. S. Sarma, Departm of Biochemistry, Indian Institute Science, Bangalore-12).

Estrogens induce the synth sis of two new proteins, phosvi and lipovitellin in the rooster liv Actinomycin D prevents this indu tion thereby showing that the estr gens act by way of stimulation mRNA synthesis. The binding estradiol to cytoplasmic and par culate fractions in the liver been investigated. (Dr G. P. T war, Department of Biochemist All India Institute of Medi Sciences, New Delhi 16).

Glycosaminoglycans have been lated and characterized in e brain of various species of imals. The concentration of total AG in brain has been found to vary om one species to another. An zyme which transfers sulphate om PAPS to glycosaminoglycans form both N- and O-sulphated oducts, has been purified from ung rat brain and its properties ve been studied. Sialic acid can removed from brain alkaline osphatase II by neuraminidase gestion without loss of activity. esialation can be effected by a icrosomal sialotransferase. A w concept of isoenzymes contain- g varying amount of carbohydrate proposed. (Dr B.K. Bachhawat, epartment of Biochemistry, Chris- an Medical College and Hospital, ellore).

Enzymes dephosphorylating uctose-1,6-diphosphate, and β- ycerophosphate have been detec- d in the tissues of angiosperm arasites. Respiratory particles om *Cactus phylloclades* have been hown to contain the Krebs cycle nzymes and the electron transport hain. A diurnal variation in the xidation of succinate and in the /O ratio has been observed in ese particles. The particles lose e capacity for oxidation and phos- horylation with ageing. (Dr P.S. rishnan, Department of Bioche- istry, Lucknow University, Luck- ow).

A 10 000 g fraction of sonica- d mitochondria from etiolated edlings of *Vigna sinensis* has en found to be more active than e intact mitochondria in protein nthesis. This protein synthesis inhibited by chloramphenicol, reptomycin and actinomycin D but t by puromycin. (Dr S.C. Rcy, epartment of Biochemistry, Cal- tta University, Calcutta 19).

A cell-free preparation ntaining NADH oxidase, NADH- CIP reductase, NADH-fer- cyanide reductase and NADH- tochrome C reductase has been tained from *Agrobacterium tume- ciens*. Cyanide inhibits only the ADH oxidase activity. (Dr N. paji Rao, Department of Bio- emistry, Indian Institute of ience, Bangalore 12).

The biopotency of 5,6-monoepoxy derivatives of vitamin A has been determined in rats with regard to three functions controlled by vitamin A, viz. vision, reproduction and growth. Vision and growth are not affected, but fertility in female rats only is impaired by administration of 5,6-monoepoxy retinal. Retro-vitamin A is found to exert its biological activity only after conversion to the all-trans form. (Dr H.R. Cama, Department of Biochemistry, Indian Institute of Science, Bangalore 12).

Studies have been carried out on small bacteriophages, Phage M 13, a single-stranded circular DNA-containing phage, is known to ooze out of infected bacteria without killing the latter. It is also known that along with the liberation of phage, a lipopolysaccharide (LPS) is liberated. In the present studies it has been found that M 13 actually induces an enzyme in infected *Escherichia coli* which liberates LPS from the bacterial membrane, enabling phage particles to ooze out without lysing the bacteria. (Dr S. Mitra, Department of Microbiology, Bose Institute, Calcutta 9).

CECRI Annual Report: 1967

The Annual Report of the Central Electrochemical Research Institute (CECRI) for 1967 has been published. The 140-page (crown 4to) report reveals that a major investigation completed by the institute related to the production of magnesium metal from Salem magnesite. The investigation was sponsored by the Government of Madras to whom a report on the production of the metal on 12 kg/day scale was furnished. The institute also prepared a project report for setting up a semi-commercial unit of capacity 250 kg/day. Magnesium powder of grade '0' meeting the specifications of defence establishments was prepared.

Optimum conditions for the electrolytic preparation of the following chemicals have been established: aminoguanidine bicarbonate by reduction of picrite, metalinic acid by reduction of *m*-nitrobenzene sulphonic acid, *p*-aminobenzoic acid by reduction of *p*-nitrobenzoic acid, *o*-aminotoluene by reduction of *o*-nitrotoluene, *p*-nitrobenzoic acid by oxidation of *p*-nitrotoluene, and lead dioxide from lead monoxide. In the field of electrometallurgy the institute prepared a cerium-bearing alloy as a substitute for the imported alloys for production of mehenite and spheroidal cast iron.

A new phosphating formulation based on magnesium phosphate and phosphoric acid, useful for brush, dip and spray application, has been developed. An inhibitor for preventing corrosion in solder and an electrolytic method for producing oxalate coatings to reduce wear in mechanical operations have been developed. Porous carbon electrodes which can give a continuous current of 5 amp at a terminal voltage of 1 V have been developed. Silver oxide-zinc cells of 20 amp capacity, which find use in aircraft and portable equipment, have been developed by the institute. Under a sponsored scheme, the institute formulated a low silver cyanide plating solution for silver plating of copper wire used in the manufacture of half-fine jari; silver plating using the solution takes only 12 min.

The institute released to the industry for commercial utilization the know-how for the production of: salicylaldehyde, benzaldehyde, Mg-CuCl and Mg-AgCl water-activated batteries, soldering of magnesium alloy, aluminium lithoplates, potassium iodate, calcium gluconate, benzidine and substituted benzidines. Twenty-eight patents were filed in India and 7 were filed in foreign countries. Sixty-four research papers were published by the staff.

Five inventions of the institute received awards at the 27th All India Industrial Exhibition, Hyderabad, 1967. The award-winning processes were: new alkaline primary wet cell system, porous carbon electrodes for use in air-depolarized cells, prevention of tarnish of copper and copper based alloys, anticorrosion packaging, and rust and scale removing jelly. Three inventions relating to benzidines and substituted benzidines, misch metal, and magnesium from magnesite or seawater received the awards o the Inventions Promotion Board

Technical Services and Testing Facilities: CMRS Services to Mining Industry

Among the many services which the Central Mining Research Station (CMRS), Dhanbad renders to the mining industry the provision of a wide variety of testing facilities is perhaps the most important. Through its testing and certification work on flame-proof equipment, such as motors, switchgears and fans, and other apparatus and equipment for use in mines, the station helps both the mining and the mining machinery industries. Facilities are also available for gallery testing of permitted explosives by explosives manufacturing industry. Routine analyses are carried out of gas, air, dust and water samples. Facilities are available for testing miners' equipment, including flame safety lamps, electric caplamps, hand lamps and safety torches, and for destructive and nondestructive testing of engineering equipment and components such as wire ropes, chains, shackles, safety hooks, friction props and hydraulic props.

The revenues of the laboratory through its technical services have been steadily increasing over the years — from Rs 0.33 lakh in 1957-58 to Rs 2.48 lakhs in 1967-68. The total earnings during the 10-year period amounted to over Rs 12 lakhs.

Flame-proof Testing

The laboratory is fully equipped to carry out tests on flame-proof enclosures of electrical equipment, for use in gassy mines and other hazardous locations, where there is a possibility of explosion due to the presence of inflammable gas or vapour. So far, over 150 equipment of Indian and foreign make have been tested. The equipment include motors, transformers, switch-gears and fans.

The tests comprise examination of the drawings and equipment, preliminary pressure test, external ignition test, over-pressure test and physical examination of the equipment. When the drawing is found to conform to the required specifications the manufacturer is required to prepare a prototype according to the approved drawing. After physical examination, the prototype is subjected to a series of other tests. The apparatus is placed in a gas chamber and both the interior of the apparatus and the gas chamber are filled with inflammable gas mixtures. The gas mixture inside the apparatus is ignited by an electric spark; the apparatus fails the test if the explosion within it ignites the surrounding mixture. In the case of imported equipment, the constructional features that are at variance with the Indian Standard specification for flame-proof enclosures of electrical apparatus are reported.

Intrinsic Safety Testing

Electrical equipment, working on much lower voltages, for use in possibly inflammable atomospheres must be so designed that they do not produce sparks that can ignite the atmosphere either in normal working or in faulty conditions. The apparatus for testing such intrinsically safe electrical equipment is available at CMRS. The purpose of the test is to ensure that a proper safety device is incorporated to suppress the spark to a magnitude which will not cause ignition or explosion.

Dust-tight Equipment Testing

Dust-tight electrical equipment fi
use in areas where inflammable e
plosive dust is present. Su
equipment are used mostly in d
fence installations and warehouse
These equipment are tested f
safety against hazards from i
flammable and explosive dusts.

Explosives Testing

Facilities for gallery testing
permitted explosives used in coa
mines for bringing down coal a
made available by CMRS since 196
Assistance is also rendered
manufacturers, to develop new co
positions of explosives.

In this test, shots are fir
from a cannon in such a way th
the products of detonation of the e
plosive are discharged directly i
a sensitive inflammable mixtu
held in a steel test gallery.
break gallery which simulates t
more dangerous condition whi
occurs when a shot fires across
break (measuring a parting in t
coal seam) is also provided. T
strength of the explosive is dete
mined by using a ballistic mort
set up for the purpose. Seve
samples of explosives from diffe
ent manufacturers in the count
have been tested.

Testing of Detonators and Exploders

Arrangements for testing of del
detonators for use in gassy min
have been made in respect of th
incendiary, storage and electric

Facilities for gallery testing of permitted type explosives used in coalmines for bringi
down coal are made available by CMRS

A wind tunnel has been fabricated at CMRS for calibration of anemometers and velometers. These devices used for air quantity measurements require frequent check and calibration

aracteristics. Prototypes of ectric detonators manufactured the country are investigated and pproved for use in mines. Explo- rs are tested as regards safety d performance in single shot and ultishot firing.

xplosibility of Coal & Factory usts

acilities are provided for testing al dusts and factory dusts for de- ermining: (i) lower limit of explo- ibility, (ii) temperature of igni- on of dust cloud, (iii) temper- ure of ignition in a layer, (iv) inimum ignition energy, (v) maxi- um pressure developed and the ate of pressure rise, and (vi) the inimum oxygen concentration. A 2 dia. 91.4 m long steel gallery as been set up for these tests.

ire Resistance Tests

esting for the fire resistance pro- erty of conveyor belts, ventilation ucting and brattices (screens used or coursing air underground) as er the standard specifications are ndertaken.

ther Equipment & Devices

nemometers and velometers used or air quantity measurements in ines require frequent check and alibration. Such facilities are ade available to the industry. ver 200 instruments have beer checked and calibrated so far. Facilities are made available for determining the characteristics of mine fans used in the field and in the laboratory. Brattice cloth used in mines for coursing ventilation to the working places is tested for air leakage property. Assistance is rendered to the mining industry by way of testing, calibrating and servicing the miners' flame safety lamps, safety helmets, electric caplamps, safety torches, methanometers, safety goggles and caplamp bulbs as per the standards for use in mines.

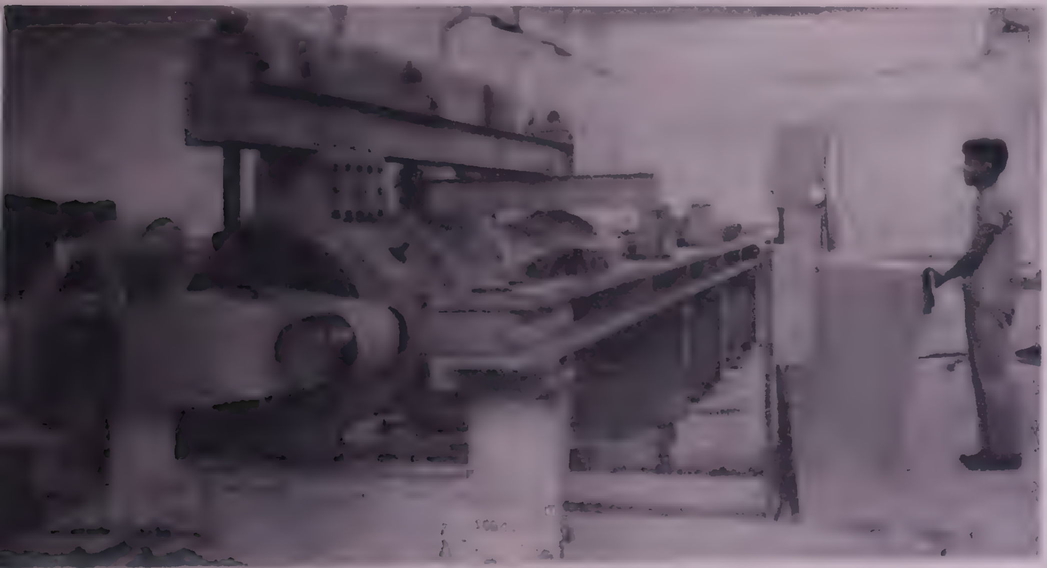
Analysis of Mine Air & Dusts

Regular collection of samples of ventilating air underground and their analysis are undertaken in a large measure. Field laboratories are also set up for these services (on temporary basis) depending on the need and demand.

Mine dust analyses for ash, moisture and carbon dioxide and proximate analysis are undertaken. Stone dust analysis is done for free silica, for sieve size, and for general dispersibility. Samples of water are analysed for steam raising, solid residue and hardness.

Testing of Wire Ropes

Hoisting men and materials safely through vertical and inclined shafts is an essential operation in mines. Accidents during hoisting are generally severe and frequently fatal with consequent loss in life and output. The reliability of wire ropes in service is greatly affected by deterioration, which may be due to improper installation and maintenance, fluctuating loading conditions, corrosion due to mine water and mine atmosphere.



500-tonne horizontal tensile strength testing machine has been installed at CMRS for esting wire ropes. The wire rope manufacturing industries draw upon the services of the station

The station has been engaged in the research, investigation, development and testing of wire ropes used in mining and allied industries. The project is also intended to promote and assist the indigenous production of wire ropes by improving upon the quality of their product. The wire ropes are subjected to static tension test. In addition, tensile, torsion and reverse bend tests and micro-examination are conducted on individual wires. A 500-tonne horizontal tensile testing machine is being used for testing wire ropes. So far, about 1300 wire rope samples, both imported and indigenous, have been investigated, tested and certified. The wire rope manufacturing industries have been utilizing these services.

Testing of Suspension Gear Components

Investigation and testing of suspension gear components are being undertaken to ensure that these components are well designed and are able to withstand service conditions. Any deviation from the Indian Standard observed during the physical examination of the components is recorded. So far, 65 safety hooks, 262 shackles, 157 chains, 42 cappels, 82 distribution plates, 107 shackle bolts, 20 mild steel rods and 14 steel link bars have been tested.

Nondestructive Testing of Colliery Equipment

Manufacturing defects and service deterioration of colliery equipment are detected by one of the following nondestructive methods: ultrasonic flow detection, X-ray and gamma ray radiographic examination, and magnetic particle crack detection. The equipment being tested include winding engine shaft, crank shaft, headgear pulley shaft, cappels, shackles, cage chains and safety hooks.

Nondestructive Testing of Wire Ropes at Site

Nondestructive tests on wire ropes at site while in use are carried out using a 'defectograph'. The oscillogram records show the number and the magnitude of the flaws in the rope. With this instrument the entire rope can be tested for flaws without removing it from the site of installation.

Microstructural Analysis of Winding Ropes

Defects which cannot be detected by mechanical tests are traced by microstructural analysis of wires. The different kinds of defects are analysed and their influence on the mechanical properties is determined.

Investigations and Testing of Mining-type Cables

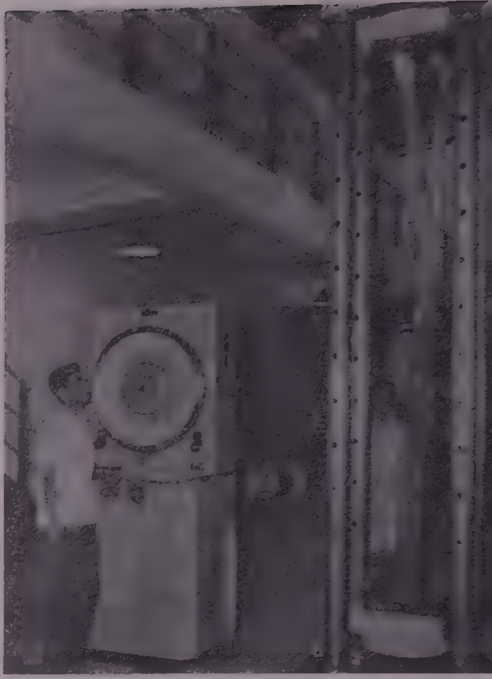
Faults in mining-type cables, viz. short-circuit fault between two insulated cores and short-circuit fault between an insulated core and screen (earth fault) are investigated and located using a cable fault locator developed in the laboratory. The instrument can locate the exact point of fault.

Premature Failure of Mining Components

Mechanical and metallographic investigations are conducted on mining components, which have undergone premature failure, with a view to ascertaining the cause of the failure. The components investigated comprise wire ropes, chain links, tub links, boiler grate, piston head, headgear pulley shaft, winding engine shaft, flyweel, fan blade, bush and neck ring of pumps. Investigation reports are supplied to the concerned parties.

Testing of Steel Props

The use of steel supports has been recently introduced in a few mines in India. Steel friction and hydraulic props are being tested in the laboratory with a 100-tonne testing machine for their load characteristics. In these props, friction plays a decisive part in the production of load bearing capacity in prop design. Studies are made under different conditions of friction surfaces, viz. (i) as received from manufactures, (ii) after applying dry coal dust on friction surfac
(iii) after applying wet coal dust
the friction surface, and (iv) i
fluence of a number of blows
frictional resistance. So far
steel friction props and 12 hydra
lic props have been tested.



Steel friction and hydraulic props a
tested at CMRS for their suitability f
use in mines under simulated undergrou
conditions

FIELD INVESTIGATIONS

Field investigations carried out f
the industry include: investigatio
on roof bolting, survey of ventil
tion conditions in mines and r
organization of ventilation syste
in mines, assessment of airbor
dust in mines and factories, mi
fire investigation and spontaneo
heating in coal stacks, operation
research on mine working pro
lems, and illumination survey.

Investigations on Roof Bolting

Roof support is a major proble
in mines, especially when there
a weak shale roof or a very b
roof by virtue of the geologic
disturbances. Bad roof conditio
result in heavy roof falls leading
serious accidents and loss of li
The need for more effective a
quicker methods of roof support
increasing with the increasing d
gree of mechanization of mines a

ith the increasing depth of the ine workings. The main purpose f this investigation is to introduce oof bolting in Indian mines on a ientific basis so that the roof and e sides in the mines could be sup- orted more economically and effi- ently.

Investigations on roof bolting nclude short-term and long-term ests. In the short-term tests, the nchorage efficiency of the bolts is etermined by carrying out pull ests by means of a hydraulic jack. n this basis the correct bolting attern and the length of bolts to be sed is recommended. The long- erm test consists in supporting the nine with roof bolts along with con- entional timbering. After this is ompleted the timber is withdrawn nd the behaviour of strata move- nent is kept under watch for a eriod of six months to one year. A umber of instruments are installed nderground for the strata move- nent investigations. A pulling force s applied with a hydraulic jack on he bolt and the anchorage slip is neasured using a dial gauge exten- ometer.

So far, short-term investiga- ions lasting one to three months ave been carried out in 16 mines nd long-term investigations lasting year, conducted in 6 mines. In everal mines, where roof bolting as been recommended, its intro- luction has resulted in increased oal output per man-shift and re- luction in the cost of supports.

Ventilation Surveys

Mine ventilation surveys are being ndertaken by CMRS since 1960. Such surveys have been carried out n 36 mines (33 coalmines, one opper mine and two gold mines). The object of the surveys is to ssess: (i) standard of ventilation in nines, (ii) pressure losses in shafts nd regions of large resistance to irflow, (iii) major defects in the ystem like huge air leakages, re- irculation, etc., (iv) efficiency of urface and underground fan, and v) economy of ventilation. The nformation would help in not only inding immediate solutions to the problems of ventilation but also in planning and efficient reorganization of mine ventilation.

Improper selection of fans in regard to blade angle and air quantity distribution may result in low working efficiency; sometimes it may result in fan failure. The surveys undertaken by the station have indicated that some of the mine fans were running at as low as 10 per cent efficiency mainly due to improper selection of fan for the mine. The surveys have also revealed that in some mines the surface air leakages were more than 50 per cent. Low fan efficiency and heavy leakages of air add to the cost of mining.

After the survey in the mine, the ventilation network is set up on an electrical analogue. Suitable modifications in the existing system are studied on the analogue in order to improve the general ventilation of the whole mine or a part of it. The analyser greatly reduces the time spent on solving network problems of mine ventilation such as the (i) effect of addition of new shafts or airways to the system, (ii) effect of opening out new seams or closing certain sections of working in the mines, and (iii) effect of installing or removing fans from the ventilation circuit in a mine. Different schemes for the reorganization of the ventilation system have been supplied to the industry.

Illumination Surveys

Mine illumination has an important bearing on safety, health and productivity of workers. Deficient illumination may affect the health of the workmen and cause industrial eye disease. With a view to assessing the effectiveness of lighting in them illumination surveys of mines are being taken up by CMRS.

Mine Fire Investigation

Self-heating characteristics of coal stacks are studied by DTA method and coals are classified in regard to their susceptibility to spontaneous combustion. Measures to prevent fire in coal stacks are suggested

The state of fire and its control in mines is investigated and assistance is rendered in regard to prevention and control of fires. Studies on self-heating in coal stacks are undertaken in mines and measures for safe storage of coal and for dealing with fires in coal stacks are suggested.

Investigation of the state of fire in a coalmine and its control has been carried out so far in eight mines and study of self-heating of coal stacks at three places.

Assessment of Airborne Dust in Mines & Factories

Mining involves many operations which produce large quantity of dust, and is associated with many health hazards. In coalmines, dust poses two problems; viz. the explosions hazard and health hazard. Assessment of airborne dust during various industrial operations and situations like drilling, handling of the minerals, transhipment, etc. is undertaken in several collieries and factories.

Operational Research on Mine Working Problems

Several investigations have been taken up by CMRS to find out the efficiency of mining operations including timbering, barricading for sand stowing, haulage and transport, and the working of the entire production districts from mine face to wagon loading.

CSIR SUPPORT TO RESEARCH
New Research Schemes : 1969-70

The Governing Body of CSIR at its meeting held on 14 May 1969 approved on the recommendation of the Research Committees, sanction of 102 new research schemes (including retired scientists' schemes) during 1969-70. Research committee-wise the break-up figures are: Atmospheric Sciences & Scientific Hydrology, 2; Biological, 23; Chemical, 37; Chemical Engineering, 2; Civil Engineering & Hydraulics, 13; Electrical & Mechanical Engineering, 5; Geological & Mineralogical, 7; Metals, 6; Pharmaceuticals & Drugs, 5; Physical, 1; and Radio & Telecommunication, 1. Subject-wise the titles of the individual schemes, inclusive of research schemes under retired scientists, are as follows:

Atmospheric Sciences & Scientific Hydrology

1 Hydrological studies in the western districts of Uttar Pradesh
Dr R.S. Mithal
University of Roorkee
Roorkee

Retired Scientists' Schemes

1 Hydrological data collection studies and investigations
Shri P.R. Krishna Rao
Central Observatory
Bangalore

Biological

1 A comparative study on the distribution of various enzymes in the central and peripheral nervous systems of invertebrates and vertebrates and the effect of drugs on them
Dr H.B. Tewari
Dept of Zoology
University of Udaipur
Udaipur

2 Action of insecticides on the neuroendocrine system and egg-production in the sugarcane leafhopper, *Pyrilla perpusilla*
Dr P.S. Ramamurty
Banaras Hindu University
Varanasi

3 Biogenetic studies in some populations of southern India with special reference to the effect of inbreeding
Dr I.P. Sinha
Delhi University
Delhi

4 Chemical and experimental studies on actinomycosis
Drs S.C. Chakravarty
& V.N. Damodaran
V.P. Chest Institute
Delhi University Delhi

5 Development and anatomical studies on *Nicotiana*
Dr J.J. Shah
Sardar Patel University
Vallabh Vidyanagar

6 Ecology and evolution of the insect communities of the high altitude torrential streams of the Himalayas
Dr M.S. Mani
St John's College
Agra

7 Freshwater fish productivity in lakes, reservoirs and tanks
Dr S.M. Das
Jammu & Kashmir University
Srinagar

8 Investigation on the functional capacity of the respiratory organs of freshwater Teleostean fishes
Dr J.S. Datta Munshi
Banaras Hindu University
Varanasi

9 Lichen flora of Nilgiri and Palni Hills
Dr D.D. Awasthi
Lucknow University
Lucknow

10 Mechanism of production of fatty liver in rats by hepatotoxins
Dr U.K. Misra
V.P. Chest Institute
Delhi University
Delhi

11 Mosquito genetics
Dr Usman M. Adhami
Aligarh Muslim University
Aligarh

12 Muscular activity in vertebrates exposed to environments
Dr R.V. Krishnamoorthy
Bangalore University
Bangalore

13 Studies on plant parasitic nematodes associated with paddy
Uttar Pradesh
Dr M. Shamim Jairajpuri
Aligarh Muslim University
Aligarh

14 Studies on the biological macr
molecules during the process
embryonic growth and maligna
growth in albino mice
Dr Jayasree Roy
Chittaranjan National Cance
Research Centre
Calcutta

15 Studies on the hypothelami
control of the physiology of reproduction in some freshwate
fishes — both viviparous an
oviparous
Drs H.N. Bhargava
& D.D. Soni
University of Saugar
Sagar

16 Study of the effects of implication of embryonic glandula
tissues
Drs S.C. Misra
& A.K. Wakhlu
K.G.'s Medical College
Lucknow

17 The morphology, biology an
control of fowl caecal nematod
Heterakis gallinarum Freeborn
Dr Jamil A. Ansari
Aligarh Muslim University
Aligarh

Retired Scientists' Schemes

1 Application of a new method
triple-bonding in the medico
legal practice of India with
view to determining blood group
by detecting the haemagglutinogen of blood in the stain
Dr A.B. Roy Choudhury
Central Forensic Science
Laboratory
Calcutta

2 Effects of cobra venom on
central nervous system
Dr R.C. Bhattacharjee
V.P. Chest Institute
Delhi University
Delhi

3 Parasitological studies of Indian birds and mammals with particular reference to protozoal parasites
Dr H.N. Roy
Presidency College
Calcutta

Structure and development of some seeds of medicinal value including their histo-chemistry
Dr Bahadur Singh
R. B. S. College
Agra

Studies in wilt disease of sugarcane
Shri P. Prakasam
Sugarcane Research Station
Anantapalle

Studies on the morphology, histology, physiology and biology of some insects of the family Pentatomidae (Hemiptera-Heteroptera), class: Insecta
Dr S. S. Saxena
Government Science College
Gwalior

hemical

A new approach of preparation of some organic compounds using metal chelates as the intermediate products
Dr Rameshwar Prasad
Dept. of Chemistry
Patna University
Patna

A systematic study of derivatives of III and IV group elements with nitrogen and sulphur containing organic ligands
Dr T. N. Mishra
Dept. of Chemistry
Gorakhpur University
Gorakhpur

Chemical, biochemical and nutritional studies on vitamin A carotenoids
Prof. H. R. Cama
Dept. of Biochemistry
Indian Institute of Science
Bangalore

Chemical investigation of pigments of marine animals with particular reference to echinoderms
Prof. S. Neelakantan
Dept. of Chemistry
Madurai University
Madurai

Chemical investigation of Rubiaceae and Euphorbiaceae plants with special reference to terpenoids
Dr (Mrs) Bani Talapatra
Dept. of Chemistry
University of Calcutta
Calcutta

6 Chemistry of metal picrates and picramates
Dr S. P. Agrawal
Dept. of Chemistry
Gorakhpur University
Gorakhpur

7 Chemistry of the extractives of some Rutaceae, Apocynaceae and Leguminosae plants
Dr S. K. Talapatra
Dept. of Chemistry
Calcutta University
Calcutta

8 Complex carbonates of transition metals and rare earths
Dr A. Sengupta
Dept. of Chemistry
Kalyani University
Kalyani (West Bengal)

9 Coordination compounds of rhenium
Dr P. Bandyopadhyay
Dept. of Chemistry
Calcutta University
Calcutta

10 Correlation of the rate with the acidity in redox reactions
Dr R. N. Mehrotra
Dept. of Chemistry
Jodhpur University
Jodhpur

11 Development of an integrated process for the production of amino acids and single cell protein from microorganism utilizing petroleum hydrocarbons
Dr V. D. Tamhane
Dept. of Chemical Technology
Bombay University
Bombay

12 Electrochemistry of membrane electrodes in aquo-organic media
Dr M. Adhikari
Dept. of Applied Chemistry
Calcutta University
Calcutta

13 Electrochemistry of proteins, polypeptides and ionogenic complexes
Prof. R. P. Mitra
Dept. of Chemistry
Delhi University
Delhi

14 Electrometric studies and interpretation of electrode potentials, acid dissociation constants and thermodynamic parameters in nonaqueous solvents
Dr S. P. Rao
Dept. of Chemistry
University of Jodhpur
Jodhpur

15 Elucidation of the nature of metal-sulphur bonds
Dr U. C. Agarwala
Dept. of Chemistry
Indian Institute of Technology
Kanpur

16 Enzymes of DNA metabolism in bacteria and phase-infected bacteria
Dr S. Mitra
Dept. of Microbiology
Bose Institute
Calcutta

17 Fundamental investigations on the biochemistry and biosynthesis of Indian silk fibreins
Dr R. S. Dhavilkar
Biochemistry Division
Maharashtra Association for the Cultivation of Science
Poona

18 1, 3-Iso-steroids: some potential and organic, progestational and cortical hormones
Prof. S. M. Mukherji
Dept. of Chemistry
Kurukshetra University
Kurukshetra

19 Kinetics and mechanism of oxidation of organic compounds by aqueous alkaline ferricyanide in osmium catalyst
Dr M. P. Singh
Dept. of Chemistry
Allahabad University
Allahabad

20 (i) Kinetics and mechanism of reactions in solution with particular reference to ion-dipolar molecules; and (ii) Physico-chemical studies of azoxy complexes formed by rare and rare earth metals
Dr S. V. Singh
Dept. of Chemistry
Birla Institute of Technology
Mesra, Ranchi

21 (i) Kinetics and mechanism of reduction of cobalt; and (ii) amino complexes by metallic ions
Dr Bal Krishna
Dept. of Chemistry
Allahabad University
Allahabad

22 Kinetics and mechanism of some new redox reactions involving chloramine-T as oxidant
Dr S.P. Mushran
Dept. of Chemistry
Allahabad University
Allahabad

23 Optical activity and reaction mechanism
Dr I.G. Vasi
Dept. of Chemistry
University School of Sciences
Gujarat University
Ahmedabad

24 Polarographic and spectral aspects of some bimolecules and related organic substances
Dr S.K. Chakravarti
Dept. of Chemistry
University of North Bengal
Darjeeling

25 Preparative coordination chemistry
Dr Subrata Lahiry
Dept. of Chemistry
University of Delhi
Delhi

26 Role of insulin in the protein synthesis by the thyroid glands
Dr V.N. Singh
V.P. Chest Institute
Delhi University
Delhi

27 Spectroscopic studies of hydrogen bonding and charge transfer processes
Dr C.N.R. Rao
Dept. of Chemistry
Indian Institute of Technology
Kanpur

28 Studies on phosphofructokinase of intestinal mucosa, liver of rabbit and yeast
Dr A. Ramaiah
Dept. of Biochemistry
All India Institute of Medical Sciences
New Delhi

29 Studies on proteolytic enzymes, physico-chemical enzymatic and structural studies on goat trypsin
Dr N.K. Sinha
Dept. of Chemistry
Bose Institute
Calcutta

30 Study of electrical double layer
Dr K.M. Joshi
Dept. of Chemistry
Institute of Science
Bombay

31 Synthesis and physico-chemical studies of some new sulphur ligands
Drs S.N. Tandon
& P.K. Srivastava
Dept. of Chemistry
Roorkee University
Roorkee

32 Synthesis and reactivity of phosphonitriles
Dr Baldev Singh Manhas
Dept. of Chemistry
Punjabi University
Patiala

33 Synthesis of diterpenoid alkaloids
Dr Baldev Kumar
Dept. of Chemistry
Punjabi University
Patiala

34 Synthesis of oligonucleotides of defined sequence and studies on their antigenic properties
Dr T.M. Jacob
Indian Institute of Science
Bangalore

35 Synthetic investigations on steroids
Prof. D.K. Banerjee
Indian Institute of Science
Bangalore

36 Transformations of triterpenes
Dr H.N. Khastagir
Dept. of Chemistry
University of North Bengal
Darjeeling

Retired Scientists' Schemes

1 Investigations on ancient Indian materials — ceramics
Dr S. Paramasivan
Central Leather Research Institute
Madras

Chemical Engineering

1 Development of mathematical models of 3 in. hydrocyclone and study of scale-up factors for design of industrial size unit
Dr T.C. Rao
Indian Institute of Technology
Kanpur

2 Production of carbon disulphide from (1) charcoal -SO_2/H_2S; (2) coal char/lignite char - SO_2/H_2S; (3) CO_2/CO- SO_2/H_2S; and (4) natural gas - SO_2/H_2S
Dr S.C. Naik
Shri S.R. Reddy &
Shri A.K. Gayen
Regional Engineering Colleg
Rourkela

Civil Engineering & Hydraulics

1 An investigation on the moistur differential in cement paveme slabs
Prof. V. Venkatasubramani
& Shri M.G. Michael
Regional Engineering Colleg
Tiruchirapalli

2 Basic studies on unsaturate porous media flow with applications to drainage and infiltratio problems
Dr S.V. Kameswara Sarma
Regional Institute of Technology
Jamshedpur

3 Behaviour of bulbed channe sections of light gauge steel i pure flexure
Dr S. Divakaran
Dept. of Structural Engineering
University of Jodhpur
Jodhpur

4 Behaviour of various types raft foundations in various type of soils: study of the relatio between stiffness of structu foundation system and the rig dity of underlying soil
Sarvashri A. Janakirao,
K. Koteswararao &
K.V.S. Apparao
Andhra University
Waltair

5 Development of high tensi strength concrete for structur use
Drs S.P. Gupta
& R.L. Jindal
Punjab Engineering College
Chandigarh

6 Effects of disturbances and fi tings on laminar pipe flow
Prof. N.S. Lakshmana Rao
Indian Institute of Science
Bangalore

7 Elastic and ultimate load behaviour of continuous singly curv shell roofs
Shri D.A. Inamdar
Visvesvaraya Regional Coll of Engineering
Nagpur

Influence of load on the ultimate strength capacity of reinforced concrete beams under static and dynamic loading flexure, and shear studies
Sarvashri A.N. Lakshmanan
& P. Seetharam
P.S.G. College of Technology
Coimbatore

Interaction relation for reinforced concrete prismatic members under combined bending and torsion and under combined shear and torsion
Shri Y. Ananthanarayana
P.S.G. College of Technology
Coimbatore

Investigations on rockfill dams for through and overflow
Dr Gerhard Rouve
Indian Institute of Technology
Madras

Stress and deformations of multilayered pavement system
Dr Jagdish Narain &
Shri S.K. Khanna
University of Roorkee
Roorkee

Studies on sediment movement in and around Kakinada Bay in relation to the development of Kakinada port
Dr M. Subba Rao
Andhra University
Waltair

Ultimate load analysis of reinforced concrete structures subjected to combined flexural and torsional loadings
Dr V. Ramakrishnan
P.S.G. College of Technology
Coimbatore

ectrical & Mechanical Engineering

A fast acting excitation controller for alternators in power stations
Drs A. Kuppurajulu &
M. Venugopal
Indian Institute of Technology
Madras

Development of induction motor with asymmetrical rotor
Dr P. Mukhopadhyay
University of Roorkee
Roorkee

Development of static circuits for (i) protective relays in power systems, and (ii) power conversion
Dr M. Ramamoorty
Indian Institute of Technology
Kanpur

4 Investigation of boiling heat transfer in binary systems
Dr C.P. Gupta
Dept. of Mechanical Engineering
University of Roorkee
Roorkee

5 Investigation of optimum power requirements for metal cutting under varying conditions
Shri Gunwant Sham Rao Kadu
Dept. of Mechanical Engineering
Visvesvaraya Regional College of Engineering
Nagpur

Geological & Mineralogical

1 Geochemical, petrological and genetic studies of the high-sulphur Assam coals with a view to beneficiating the coals and isolating sulphur for utilization
Dr Bankim Chandra Mukherjee
Dept. of Geology
Jadavpur University
Calcutta

2 Mineralization connected with the Deccan Trap igneous activity
Dr S.C. Chatterjee
School of Studies in Geology
Vikram University
Ujjain

3 Photogeomorphic studies of the Quaternary of Orissa and West Bengal
Dr D. Niyogi
Dept. of Geology
Indian Institute of Technology
Kharagpur

4 Regional gravity and magnetic investigations in parts of the Gondwana Basin and Eastern Ghats of Bezwada-Ongole region
Drs V. Bhaskara Rao
& P. Sitapathi Rao
Andhra University
Waltair

Retired Scientists' Schemes

1 Economic geology of Sandur iron ore and magnesium ore deposits
Dr M.S. Venkataram
Geological Survey of India
Calcutta

2 Geology of the Pre-Cambrian formation of South India
Dr C.S. Pichamuthu
Dept. of Mines & Geology
Bangalore

3 Geology, tectonics and oil resources of Kutch including other minerals
Shri M.C. Poddar
Research & Training Institute
Oil & Natural Gas Commission
Dehra Dun

Metals

1 Measurement of diffusion coefficient of oxygen in copper and some internally oxidized copper alloys by solid state electrolytes
Drs V.B. Tare
& S.H. Ghude
Banaras Hindu University
Varanasi

2 Pre-reduction of manganese ores for ferro-manganese smelting
Dr P.R. Khangaonkar
Visvesvaraya Regional College of Engineering
Nagpur

3 Studies on corrosion by condenser water
Dr A.M. Trivedi
University of School of Sciences
Gujarat University
Ahmedabad

4 Studies on (i) phase transformation and order-disorder phenomenon in binary alloys and physical properties; (ii) magneto resistance, permeability and hysterisis loss in binary alloys; (iii) variation of resistance and thermo-electric power with temperature and composition of some binary alloys
Prof. A.T. Maitra
Drs R.S. Prasad
& B.N. Singh
Patna University
Patna

5 Thermal properties of mould materials and their application to solidification problems
Shri H. Md Roshan
Indian Institute of Technology
Madras

Retired Scientists' Schemes

1 Anti-corrosive and scratch resistant peel-off lacquer for protection of aluminium and light alloys; and pretreatment for structural aluminium
Dr B. N. Ganguli
Defence Research Laboratory (Material)
Kanpur

Pharmaceuticals & Drugs

1 Drug intermediates from 2, 6-lutidine, a coal tar base fraction
Dr H. P. Tipnis
Dept. of Chemical Technology
Bombay University
Bombay

2 Studies in the synthesis of potential hypoglycemic agents
Dr H. G. Garg
University of Roorkee
Roorkee

3 Studies on certain antitumour antibiotics
Dr Durlar K. Roy
Dept. of Pharmacy
Jadavpur University
Calcutta

4 Studies on parasitic fungi associated with the grain of Paspalum scrobiculatum Linn. regarding their pharmacological activity as tranquillizers
Dr G. S. Pendse
Drugs Research Laboratory
Poona

5 Synthesis and pharmacology of new drugs
Dr S. Seshadri
Dept. of Chemical Technology
Bombay University
Bombay

Physical

1 Internal electric quadrupole field by perturbed angular correlation studies
Prof. H. S. Hans
Dept. of Physics
Panjab University
Chandigarh

Radio & Telecommunication

1 Study of VLF waves and whistlers at low latitudes employing multistation technique
Dr B. A. P. Tantry
Banaras Hindu University
Varanasi

PATENTS

Filed

118516: A household sprayer for the application of water dispersible insecticidal formulations and fumigant emulsions in rat burrows, S. K. Majumdar & J. K. K. Rao — CFTRI, Mysore.

118517: An insecticidal vaporant for household and industrial pest control, S. M. Ahmad & S. K. Majumdar — CFTRI, Mysore.

118518: A new coating composition for carbon paper production, C. N. Saikia, B. P. Chaliha, S. B. Lodh & M. S. Iyengar — RRL, Jorhat.

118570: A brick extrusion machine, S. S. Wadhwa, N. C. Majumdar, L. K. Srivastava & E. S. H. Lal — CBRI, Roorkee.

118674: Admixture for cement concrete for improvement of compressive strength and workability resulting in saving of cement, G. P. Sastry, A. C. Khazanchi & M. S. Iyengar — RRL, Jorhat.

Accepted

109083: A process for imparting simultaneous improvements in flex abrasion resistance, tear strength and wet crease shedding properties to cellulosic textiles, V. B. Chipalkatti, N. B. Sattur, J. Varghese, H. C. Rastogi & R. C. Gupta — SRIFIR, Delhi.

Sealed

102483: A method for recovering metallic values in an agglomerated form from waste metallic fines particularly zinc and aluminium fines, G. Basak, V. S. Sampath & P. P. Bhatnagar — NML, Jamshedpur.

103067: Improvements in or relating to the electrolytic preparation of perchlorates, H. V. Udupa, S. Sampath, K. C. Narasimham, M. Nagalingam, C. Jacob Raju & P. P. G. Rao — CECRI, Karaikudi.

103217: Improvements in or relating to preparation of 3,3'-bis-chloromethyl oxacyclobutane, D. Jain, M. Krishnan & R. T. Thampy — SRIFIR, Delhi.

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Advt No. 19/69

Applications are invited for the post of Director, Central Electrochemical Research Institute, Karaikudi under the Council of Scientific & Industrial Research.

Scale of pay: Rs 2000-100-2500 (for an outstanding scientists a salary of Rs 2750 or Rs 3000 p. m. could be considered)

Qualifications: High academic qualifications in electrochemistry, chemical engineering or physical chemistry. Good experience of independent research and of guiding research in areas related to electrochemistry. Experience of pilot plant and factory operations desirable.

Job requirements: The selected candidate will be required to head the Central Electrochemical Research Institute, Karaikudi and plant and guide its research programme, including pilot plants.

There is no standard form of application. Those who wish to be considered are invited to send a statement of their qualifications and attainments with the following information to the Secretary, CSIR, Rafi Marg, New Delhi 1 on or before 24 June 1969: (i) name, (ii) full postal address, (iii) date and place of birth, (iv) examinations passed and degrees and qualifications obtained with class or division year-wise, subjects taken and names of the institutions and the universities, (v) countries visited, duration and purpose, (vi) details of postgraduate work and list of publications with reprints, (vii) details of how employed so far, and (viii) names and addresses of three referees.

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CSIR NEWS

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CSIR GOVERNING BODY

Proceedings of 55th Meeting

e fifty-fifth meeting of the Govern- g Body of the Council of Scientific Industrial Research was held on May 1969 in the Parliament ouse, New Delhi. Shrimati Indira andhi, Prime Minister and Presi- nt, CSIR presided. The meeting the Technical Committee of the oard of Scientific & Industrial Re- earch (BSIR) and the sixtieth meet- g of BSIR were held on 11 and 12 ay respectively.

The Prime Minister welcomed e new members of the Governing ody and wished to place on record e appreciation of the Governing ody for the help and guidance it eceived from Dr Triguna Sen, the revious Vice-President of CSIR. elcoming the new Vice-President rof. V.K.R.V. Rao, the Prime inister expressed the hope that ith his freshness of outlook the tivities of CSIR would be en- vened.

The Governing Body discussed detail the problem of the gap tween research and industry. oth the private and the public ctors, the Governing Body felt, ould be made to take interest in digenous research. Members felt at the programmes and priorities the laboratories must be related the needs of the industry.

Prof. V.K.R.V. Rao pleaded for ose cooperation between the sci- tists working in the national labo- tories and the universities. There s scope for such collaboration in ny centres. The Vice-President preciated the efforts of Dr Atma m, Director General, Scientific & lustrial Research, in initiating veral measures aimed at identi- ng research problems in consul- ion with industries and involving them from the early stages in the research and development projects of the national laboratories. To make indigenous research more effective, Prof. Rao said, it may be worth while to identify 50 to 60 major industries and link them with the R & D work of the laboratories.

Discussing the problem of translation of research results to actual production, Dr Atma Ram explained that a research institution could only deliver a workable idea and that the development of the know-how to the commercial stage should be done by industry.

The Deputy Prime Minister Shri Morarji Desai regretted that in spite of tax concessions on expenditure on research and development, industry has not taken advantage of this facility.

Referring to foreign collaboration, Shri Fakhruddin Ali Ahmed, Minister of Industry, Internal Trade & Company Affairs, said that CSIR was consulted before licence was granted to a party to set up a new industrial unit. He pointed out that in many cases foreign agreements were defective because they did not permit the further development of industry without assistance from abroad. The Minister exhorted Indian industry to invest in research; if individual units cannot afford to do so, they should form a consortium and seek CSIR's help. In this context the Prime Minister desired that either CSIR or the Directorate General of Technical Development should act as a clearing house for information on processes which have been developed in India and that application for licences for setting up industrial units with foreign collaboration should be considered in the light of the data collected.

Approval was accorded by the Governing Body to the recommendation of BSIR that the Indian Rubber Manufacturers Research Association and the Indian Paint Research Association be qualified for receiving grants under its scheme 'Industrial Research Associations'.

The Governing Body approved the setting up of the following pilot plants for: (1) production of synthetic quartz single crystals suitable for the electronic industry at the Central Glass & Ceramic Research Institute (CGCRI), Calcutta; (2) radiation shielding windows for nuclear reactors at CGCRI, Calcutta; (3) fabrication of electrical transducers and associated measuring instruments at the National Aeronautical Laboratory (NAL), Bangalore; (4) fabrication of data logging systems at NAL, Bangalore; (5) technical preparation of organic intermediates at the National Chemical Laboratory (NCL), Poona, and (6) development of bulk organic chemicals based on byproducts of the petrochemical industry at NCL, Poona.

Grants totalling Rs 111.20 lakhs to 212 research schemes at university departments and research institutions were approved by Governing Body. The list of schemes (102) tenable during 1969-70 has been published in CSIR News, Vol. 19, p. 92-96.

Symposium on Low Cost Waste Treatment

The Central Public Health Engineering Research Institute, Nagpur is organizing a symposium on Low Cost Waste Treatment in Nagpur from 27 to 29 Oct. 1969.

The opening session on 27 Oct. will be followed by presentation of technical papers and discussion in seven technical sessions on the following topics: (1) Some theoretical aspects of extended aeration process; type of oxidation ditches and their performance; (2) Design of oxidation ditches; design of rotor and its oxygenation capacity; excess sludge, its withdrawal and drying; problems in operation of oxidation ditches; (3) Use of 'package plants' for sewage treatment; examples of oxidation ditches in India; tertiary treatment with oxidation ditches; (4) Aerated lagoons and their performance; design and construction of aerated lagoons; (5) DOC/BOD relationships for sewage and industrial wastes; cost analysis for different waste treatment methods; (6) Anaerobic lagoons in waste treatment; further performance studies on oxidation ponds in India; and (7) Dieaway of pathogens in sewage treatment; miscellaneous methods (septic tanks, etc.).

Dr A. Pasveer, Public Health Engineering Research Institute, Delft, Netherlands, a specialist in oxidation ditches, will be participating in the symposium. Participants from some other countries will also be attending under the auspices of WHO.

Synopses of the papers (in duplicate) not exceeding 500 words should reach the organizing secretary by 15 July and the full text of the papers not later than 15 Aug. 1969.

Intending participants may write to the Director, Central Public Health Engineering Research Institute, Nehru Marg, Nagpur 3 for further information.

Symposium on Chemistry and Metabolism of Lipids and Related Subjects

A symposium on the 'Chemistry and metabolism of lipids and related subjects' will be held under the joint auspices of the Society of Biological Chemists, India; Vallabhbhai Patel Chest Institute, University of Delhi; Indian Council of Medical Research; and the Council of Scientific & Industrial Research in New Delhi on 3 and 4 Oct. 1969.

Only research papers will be accepted for presentation in the symposium. Abstracts not exceeding 250 words and conforming to the format of Biological Reviews (published by the Society of Biological Chemists, India) should be sent to Dr U.K. Misra, Convener, V.P. Chest Institute, Delhi 7 before 15 July 1969. Intending participants may contact the convener for further particulars.

RRL, Hyderabad Annual Report: 1967-68

The Annual Report of the Regional Research Laboratory, Hyderabad (royal 8vo, 135 pages) reveals that as in the previous years the laboratory took up for investigation, besides its regular programme of work, projects sponsored by industry and other organizations. The sponsored projects (11) included three investigations supported by the US Department of Agriculture (PL 480), viz. (1) Hydroxylated derivatives of linseed and safflower oils, (2) Preparation of polymerizable monomers from castor oil hydroxy unsaturated fatty acids, and (3) Studies on the growth of *Aspergillus flavus* and the production of aflatoxin in cottonseed.

As part of the programme for testing Maharashtra coals for their suitability for low temperature carbonization (l.t.c.) 200 tonnes of Umrer coal were carbonized in the pilot plant. Fluidized carbonization of noncaking Singareni coals is also under investigation and a 1 tonne/day pilot plant has been designed. A pilot plant for biological oxidation of l.t.c. effluents was set up in collaboration with the Hyderabad Zonal Centre of the Central Public Health Engineering Research Institute, Nagpur. Conditions for maturing char briquettes have been established in a 100 kg/day bucket-type unit. An externally-heated high temperature carbonizer (50 kg/batch capacity) for the production of metallurgical coke from low grade coals was designed.

A process for production of cardanol and refining of cashewnut shell liquid (CNSL) was leased to Card-Chem Industries, Hyderabad and a 2-tonne/day plant was designed for the firm. Some new resins and coating compositions based on CNSL were developed in the laboratory which include alcohol- and white spirit-solubl phenolic resins, cycle enamels cable cloth impregnation materia and anticorrosive paints.

The laboratory continued t manufacture standard pyrometri cones and sold about four lakh cone during the year. The process ha been leased out to Micro-Ceramic (P) Ltd, Hyderabad for progressiv manufacture. Suitable glass-to metal seals for use in terminal for refrigeration compressor unit were developed for the Allwy Metal Works Ltd, Hyderabad.

The laboratory made considerable progress in the field o basic researches. The direct addition of ethylene oxide to castor oi to any desired degree has bee achieved and the highly ethenoxylated products were found to b excellent water-in-oil emulsifiers Work on hydrogenation of soaps ha thrown new light on the nature o products found as a result of catalyst poisoning. It has bee shown that the main effect is t reduce isomerization within, rathe than between stereo forms of unsaturated fatty material.

A method for preparing 2-substituted benzimidazole derivative has been developed by reacting 1,2-diaminobenzene and aralkyl acid using phosphorus oxychloride an phosphorus trichloride as condensing agents.

Five processes developed b the laboratory have been release to industry: (1) anhydrous calciu sulphate, (2) beneficiation of of coloured barytes, (3) slide rule and allied products, (4) sodiu azide, and (5) benzyl cyanide.

During the year, 58 paper were published. Six patents relatin to the following processes an products were filed during th year: (1) cation exchanger fro coal tars and coal tar pitche (2) improved surface coatin materials from CNSL, (3) coati materials and adhesives fro cardanol, (4) emulsion paint vehicl from styrenated copolymers drying and semidrying oils, (5) su face coating materials from CNS distillation residue, and (6) therm static shaking baths.

YMPOSIUM ON BUILDING PHYSICS IN TROPICS

international symposium, 'En- onmental Physics as applied to ldings in Tropics' was held at Central Building Research Insti- e (CBRI), Roorkee (25 to 27 Feb. 9) (*CSIR News*, Vol. 19, 1969, 9). The objective of the sym- sium was to highlight the work ne during the past few years so t more collaborative work with eign scientists in building phy- s could ensue. Scientists from stralia, W. Germany, UK, USA, SR, Czechoslovakia, Holland, S. rica, Indonesia and S. America ended.

There were three technical ssions devoted to climatology, ylighting and heat transfer; and in , seventeen papers were presen- l and discussed.

The first session on Climato- gy discussed primarily methods presentation of climatic data for use of the builder. The aim was assess the heat gain on the riously oriented surfaces for veral latitudes. Ballantyne and encer (Australia), and Victor gyay (S. America) presented a mber of tables of solar load plicable to 30 degree latitude. rl Mahoney (Hawaii) brought out need for standardization in ilding design in relation to solar ad and heat gain. Koteswaram d Ramamurthi (India) explained w wind data can be correlated th thermal data. Sharma and arafat Ali (CBRI, India) discussed length an improved method of mputing the solar heat gain on rious surfaces in a building.

The session on Daylighting pro- ded a forum to consider the design y for Indian conditions in the ntext of tropical buildings. Kittler zechoslovakia) discussed the cor- lation between the existing data d the C.I.E. clear sky, which he d proposed earlier. Kendrick ustralia) emphasized the need for daylight code for tropical build- gs especially where daylight was ailable in abundance outside. rasimhan, Saxena and Maitreya BRI, India) described the tropical sign sky which they have proposed r Indian conditions with special reference to multistoreyed constructions and the consequent variations on window dimensions based on the several types of skies. Van Bremen (Holland) discussed the need for lighting levels based on external climates like arid or humid in the tropics in relation to clear and overcast skies.

Krochmann (W. Germany) in a special talk on the spectroradiometric and photometric entities that entered daylighting calculations pointed to the special significance of measured data in tropical daylighting.

Selective use of materials for construction in preventing heat gain was the theme of the final session on heat transfer in buildings. Van Straaten (S. Africa) and Harry T. Mei (USA) emphasized the reverse heat flow and vapour transfer through materials, particularly in the tropics and the methods to stop this flow. Harold Hay (USA) discussed his scheme of movable panels for summer and winter comfort. Rao (CBRI, India) described an improved method for calculating the transient heat flow in fabrics. Suri and Saini (India) dealt at length with their method of assessment of the solar air heater design for winter heating. Rao, Jain and Agarwal (CBRI, India) described their degree hour rating in relation to corrected effective temperature and room environmental temperature. Livchak (USSR) deplored the tendency to use excessive glazing in buildings. He pointed out that economical use of glass will not only reduce solar heat gain but also the cost of construction, in some cases even up to 30 per cent. The studies of Moscow buildings showed that with economized glazing, indoor temperature in summer could be lowered up to 3.5°C. In cases where a vapour barrier was to be incorporated the barrier could be at the middle than elsewhere.

There was a general appreciation of the magnitude of the problems that face building constructions in the tropics. It was felt that the expanding cost and the increase in knowledge should provide necessary incentive to evolve optimal techniques in solving the comfort problems in building design.

The need for critical studies of the external climatic factors was imperative and unless there is precise information on these factors their control inside a building will be impossible. The study of the sky for its luminance, irradiance and spectral distribution should be undertaken on a global scale. The discussions pointed to the need for extensive study and analysis of the performance of building materials for their heat transfer coefficients and the employment of advanced techniques for such studies.

Collaboration among international agencies and institutes is necessary for using research information in the tropical belt, and lastly there is need to explore avenues through which the newer information is made available to the architect or designer in the field.

The symposium also recorded the progress made in building physics in recent years and helped to identify areas where further research is needed and to strengthen the existing links between the research institutes and other organizations working in the field.

The papers presented at the symposium have been mimeographed by the Central Building Research Institute, Roorkee in two volumes.

INSDOC TRAINING COURSE IN DOCUMENTATION & REPROGRAPHY

The following candidates have been declared successful in the examination conducted during 1967-68. The sponsor is mentioned in parentheses.

Distinction

Chaddha, O. N. (Insdoc, New Delhi); Singh, R. S. (CSIR, New Delhi); and Veeraraghavan, R. (CFTRI, Mysore).

Second Class

Arora, A. M. (Insdoc, New Delhi);
Karthikeyan, S. (NAL, Bangalore);
Khanna, M. P. (Private).
Salvi, G. N. (Bhabha Atomic Research Centre, Bombay); and
Sarangan, V. (CSIR, New Delhi).

SCHEMES IN PROGRESS

Phosphatic Deposits in Algal Limestones of Pithoragarh

Under a CSIR research scheme functioning at the Department of Geology, Lucknow University, Lucknow under the supervision of Dr K.S. Valdiya, a new horizon of mineral phosphate has been discovered in the Gangolihat Dolomites in the Calc Zone (late Pre-Cambrian) of Pithoragarh (Kumaun). This outcrop is significant in view of its possible use as a raw material in fertilizer industry.

The phosphatic stromatolite-bearing limestones constitute the younger part of the Gangolihat Dolomites. The typical form of the stromatolites is Collenia baicalica, which equates the Gangolihats with the Middle Ripheans of USSR. The stromatolites are partially or completely enveloped and locally permeated along the interlaminal partings by black opaque collophane. Preliminary analysis has shown that the encrustation of specimen from Bisabajer contains 17.67 per cent of P_2O_5. The columnar-branching colonies of algae are embedded in a mass of detrital, sand-sized pelletal carbonate. This detrital limestone is characterized by pellets, stringers and clots of collophane. The average P_2O_5 content of four random chip specimens from different localities is about 7.15 per cent. The algal laminae contain negligible amount of phosphate. On the basis of these six random chip specimens the average P_2O_5 content comes out to about 12.90 per cent.

The phosphatic horizon is traceable for about 15 km from near Deopala in the Ramganga valley, through Dungra, Chandaak Forest Office, Targaon and Marh to Bisabajer (Pithoragarh subdivision). This phosphatic horizon is also seen in the Dungri-Dundu area, east of Kanalichhina and in the valley of Dewalthal Gad in the Rinn-Dewalthal belt.

The stromatolite-bearing member of the Gangolihat Dolomites is extensively developed in the Lesser Himalaya of Kumaun and stretches for about 130 km from the Indo-Nepal border in the south-east to the Alaknanda valley and beyond in the Chamoli district of Garhwal.

The association of the collophane with the algal stromatolites is highly significant and suggests control of algae on the localization of the phosphate mineral. The black colour of this mineral is probably due to pigment resulting from the decomposition of the algal-derived organic matter. Valdiya [Econ. Geol., 63 (1968), 924] has pointed out the almost invariable association of the coarsely crystalline magnesite deposits with the stromatolites of the Gangolihat Dolomites, and has emphasized the vital role of the algae in the development of conditions favourable for the formation of magnesite. It seems that the aquatic flora of the Gangolihat sea have played a doubly significant role and effected the localization of phosphate as well.

NEW SCHEMES

Piping Resistance of Cohesive Soils

A CSIR research scheme on 'Piping resistance of cohesive soils' has started in the Department of Civil Engineering, Regional Institute of Technology, Jamshedpur under Dr A.G. Mirajgaoker, Professor and Head of Department. The phenomenon of piping has received considerable attention only in respect of cohesionless soils.

The objectives of the present research project are: (1) to evaluate the basic factors involved in piping resistance of cohesive soils and to establish their inter-relationship; (2) to establish filter design criteria for protection of cohesive soils; (3) to study the effect of initial leakage on the piping resistance of cohesive soils; and (4) to study the influence of protective filters and chemical treatment on the piping resistance of cohesive soils with an initial condition of leakage.

Two sets of experiments are under way. In the first set of experiments, the soil is supported on
circular copper plates with holes o
different diameters representin
void spaces in filters. In the other
in addition to the above set-up a
initial leakage condition is simu-
lated by drilling a hole through th
soil sample by a hand drill. Th
amount of soil eroded due to pipin
is collected and the weight percent-
age of the soil eroded in a certai
period of time is noted. The effec
of compaction, grain size of filte
material, conditions of initial leak-
age and hydraulic gradient on th
piping resistance of soil is bein
studied.

Screening of Medicinal Plant Tissue Cultures

A new scheme, 'Screening of medi
cinal plant tissue cultures for anti
microbial and antitumour activit
is under investigation since Octobe
1968 under the direction of Dr Mis
P. Khanna at the Department
Botany, University of Rajasthan
Jaipur under the auspices of th
Biological Research Committee.

Biosynthesis of secondary plan
metabolites such as alkaloid
steroids and antibiotics from highe
plants in vitro is little known. Ver
recently a few alkaloids and som
steroids have been reported. How
ever, no attempts have been mad
to obtain antibiotics from highe
plants: Khanna and Staba [Lloydi
31 (1968), 180] have screened 2
medicinal plant tissue extrac
against either Gram-positive, Gran
negative, acid-fast bacteria
fungus.

The callus tissue from seeds
the following medicinal plants
being grown as static cultures
vitro in Murashige's and Skoog
revised tobacco medium contai
ing 2,4-dichlorophenoxyacetic ac
(1 ppm) and agar (1%): Atropa be
ladona Linn., Brassica nigra Koch
Datura metel Linn., D. tatula Lin
Hyoscyamus niger Linn., Momo
dica charantia Linn., Phyllanth
emblica Linn., Sesamum indicu
Linn. and Trigonella foenum-gra
cum Linn.

An attempt is being made
screen the tissue cultures to te
their antibiotic and antifungal act
vity, to identify and isolate t
active principles both qualitative
and quantitatively.

vention of Tarnishing of Copper Silver Plated Copper

per and its alloys tarnish on osure to air and in the presence ondensed moisture. Silver and d plated copper also tarnish be- se of the pores present in pla- copper. It is of considerable ctical interest to be able to pre- t tarnishing of decorative and istic items including 'jari' eads made of silver and gold ted copper and to prevent stain- of copper sheets, tubes and res.

Tarnishing can be prevented purification of atmosphere to move atmospheric pollutants sponsible for the observed tar- hing or staining of copper; air- ht packaging; lacquering; and emical or electrolytic treatment. r preventing the tarnishing of ms like 'jari' threads, decora- e and artistic articles to be ex- sed indoors, and preservation of eets and wires, only the last two ethods are of importance. Lac- ering may interfere with the sub- quent use of the article and is ely to be costlier than chemical electrolytic treatment.

The Central Electrochemical search Institute (CECRI), Karai- di has developed a dip treatment d an electrolytic treatment for evention of tarnishing and stain- of copper and plated copper. In case of dip treatment the sol- ion has to be heated to 60°C, ile the electrolytic treatment in same solution can be carried t at room temperature.

The treatment has the follow- advantages: (1) it is less expen- e than lacquering; (2) all types of ricately shaped decorative items be treated by immersion; (3) tinuous treatment of sheets, rods wires is facilitated; and (4) sil- and gold plated copper can also treated.

Several sq dm of copper eets, silver plated copper eets and one metre length of 30 G, silver plated copper wire, ver plated brass cups and medals e been treated successfully. e hundred millilitres of the concentrate, which will be diluted 10 times to obtain the treatment solution, has been prepared.

As at present it may be necessary to import two of the chemicals required for preparing the concentrate.

A stainless steel tank of 100 litre capacity fitted with a stirrer is the major equipment required. The capital outlay (fixed) for setting up a plant is estimated at Rs 27 000 and working capital at Rs 58 000. The cost per litre of concentrate (which can be diluted 10 times to prepare the treatment solution) is estimated at Rs 1.40/litre including the container.

Recovery of Zinc from Wastes

Considerable amount of zinc metal is lost as skimmings and dross during galvanizing of iron tubes. Zinc is mostly present as oxide and metallic beads and also in the combined form with iron oxide. The zinc content of the waste depends on the process as well as the articles to be galvanized. Wastes containing as much as 75 per cent zinc content are obtained in the tube galvanizing process.

In view of the limited resources of zinc in India, it is of considerable significance to develop a method for winning the metal from wastes. Several processes are in vogue in the country for recovering zinc from the wastes of galvanizing industry. The dross or waste contains iron to the extent of 4-6 per cent. Zinc values are recovered either by remelting of the dross at high temperature in smelting furnaces or by electrolysis of an aqueous solution. However a large amount of zinc is wasted as scum in the thermal process. In the case of conventional electrolytic process, a special purification step is necessary to avoid contamination of the zinc metal obtained, and separation of iron from acid solution poses a serious problem.

The Central Electrochemical Research Institute (CECRI), Karaikudi has developed a method for the recovery of zinc. The method is free from the drawbacks of the conventional processes. The process consists in the electrolysis of a suspension of finely divided wastes in an alkaline solution between an iron anode and a stainless steel cathode. The zinc metal can be obtained either in the form of fine powder or sheet by suitably adjusting the conditions. An effective stirring arrangement keeps the entire material in uniform suspension.

The new method has several advantages. The material need not be taken in aqueous solution for the electrolysis and no purification step is needed prior to electrolysis. During electrolysis, impurities like iron are precipitated as hydroxide and do not get codeposited though they are in suspension. The process can be made continuous with frequent addition of the powdered waste and a few unit processes such as dissolution, purification and handling of large quantities of solution. The metal can be obtained in the form of a sheet or powder which can be then melted to obtain ingots. The process is also applicable to the recovery of zinc from waste of low zinc contents without an intermediate step of purification. The alkaline electrolyte can be used repeatedly without any detrimental effect on the efficiency of recovery process or purity of the metal; only the alkali lost during handling operations has to be made up. The iron content of the zinc metal is fairly low and the recovered metal can be reused for processes in which its use is not injurious.

The process has been worked out on a laboratory scale. Trials have been carried out in a 100 amp cell capable of giving 0.1 kg of zinc/hr. The zinc metal recovered in the form of sheets has been melted into ingot, with an iron content of 0.1-0.15 per cent.

Zinc wastes, caustic soda, and stabilizer are the main raw materials needed in the process. All are available indigenously.

The main items of plant and machinery needed are: ball mill, sieve shaker, storage tank, cells, anodes and cathodes, filters, melting furnace, pumps and motors.

The total capital outlay for putting up a plant capable of recovering 300 tonnes of zinc per annum has been estimated at Rs 5. 62 lakhs. The cost of processing works out to about Rs 1150/tonne of zinc produced. The process is economical even on a small scale —250 kg/day.

Parties interested in undertaking the commercial development of the processes may correspond with the Secretary, National Research Development Corporation of India, Mandi House, Lytton Road, New Delhi 1.

Studies on Carbonates of Magnesium

The carbonates of magnesium, viz. light basic magnesium carbonate, heavy basic magnesium carbonate and magnesium carbonate trihydrate, are industrially useful compounds. These are generally prepared by the reaction between a soluble magnesium salt and soda ash. An alternative and more economic method of preparation is by carbonation of a slurry of magnesium hydroxide. Studies on the formation, precipitation kinetics, methods of manufacture and surface properties of the carbonates of magnesium have been carried out by Shri B.K. Shukla of the Central Salt & Marine Chemicals Research Institute, Bhavnagar. The main conclusions of the study are as follows. When carbon dioxide gas is passed through a slurry of magnesium hydroxide the first step in the reaction is the formation of bicarbonate ions by the reaction between dissolved carbon dioxide and hydroxyl ions in solution. If the concentration of magnesium hydroxide in the slurry is high, the flow rate of carbon dioxide is low and the temperature is greater than 30°C, the competing reaction takes place between bicarbonate and hydroxyl ions on the surface of the solid giving rise to carbonate ions and subsequent precipitation of magnesium carbonate crystals. But if the temperature is kept at about 20°C and sufficiently high flow rate of carbon dioxide is maintained with a low solid-liquid ratio, the competing reaction between bicarbonate and hydroxyl ions is stopped to a great extent and a supersaturated metastable solution of magnesium bicarbonate with a concentration more than twice the equilibrium concentration is obtained.

The kinetics of precipitation of magnesium carbonate from magnesium bicarbonate follows a second order reaction. The bimolecularity of the reaction suggests that the carbonate ions are produced by the reaction between two bicarbonate ions. The inhibitive effect of sodium chloride is due to the depression of activity coefficient of bicarbonate ions in the presence of sodium chloride. Bicarbonate ions accelerate the rate of reaction.

The formation of basic magnesium carbonate from hydrated magnesium carbonate takes place due to the hydrolysis of the carbonate ions. The rate of hydrolysis of the neutral to basic salt is dependent on the rate of diffusion of carbon dioxide arising from the reaction: $HCO_3^- \rightleftharpoons CO_2 + OH^-$.

There is strong indication that basic magnesium carbonates are definite compounds and a tentative structure is proposed for light basic magnesium carbonate.

Active and light magnesium oxide is obtained by calcination of light basic magnesium carbonate at 400°C and active but heavy grade by calcination of heavy basic salt at 500°C. Both light and heavy basic carbonates have similar pore size distribution. The difference between the light and heavy basic magnesium carbonates is due to the presence and absence respectively of a large amount of permeable voids in the interparticulate space.

The researcher Shri B.K. Shukla of the institute was awarded the Ph.D. degree by the Bombay University (1968).

Estimation of Silica:

CGCRI Develops Rapid Method

A volumetric method for rapid and accurate estimation of silica in materials containing high amounts of titanium and zirconium has been developed by the Central Glass & Ceramic Research Institute (CGCRI), Calcutta.

Estimation of silica in high titanium bearing materials by the classical gravimetric method difficult and time consuming. the volumetric method, the samp after fusion with sodium peroxi in a nickel crucible is taken HCl and HNO_3 solution. Silica quantitatively precipitated K_2SiF_6 after complexing titaniu with citric acid. The precipi tate after neutralization of t free acid with NaOH solution cold, is hydrolysed, and the hydro fluoric acid liberated is titrate against standard NaOH solution.

The method compares favou ably with the gravimetric metho It has the advantage of being suff ciently rapid and accurate to b adopted as a standard procedur Estimation can be completed with in half an hour after opening th sample and the standard deviati of the results is only 0.0516.

NBG Collaborates with Bulgarian Institute of Roses

Broad outlines of a collaborativ research programme in rose (*Ros damascena*) cultivation and extrac tion of rose oil between the Institut of Roses, Bulgaria and the Nationa Botanic Gardens (NBG), Luckno were chalked out during the dis cussion which Prof. V.M. Staiko Director, Institute of Roses ha with Dr L. B. Singh, Directo NBG, Lucknow during the former visit to NBG, from 12 to 20 Ma 1969. Prof. Staikov visited NBG a part of his two-month sojourn India, under the Indo-Bulgaria Cultural Exchange Programme study rose cultivation in the countr Though Bulgaria is the largest pr ducer of rose oil, selling @ $ 150 kg in the international perfume market, the propagation of ros plants meets with certain difficu ties there. The collaborati research programme therefore la particular emphasis on the mo phology and cytology of *R. dama scena*, propagation by, and rooti of, cuttings and the yield and const tuents of the essential oil. NB has developed a method for the i dustrial production of rose oil fro *R. damascena*, with an yield 0.03 - 0.04 per cent, which is a most double the normal yield us ually obtained in foreign countries

CMERI Develops Creep Testing Equipment

ep is the time dependent plastic
rmation that accompanies
ctural materials when subjected
stress especially at elevated
peratures and if the stress
ied is maintained sufficiently
, it would result in the failure
ie material. Creep properties
material depend on the stress
ied, temperature and the metal
lloy in fabricating structure.

With the indigenous availability
some high temperature alloys,
rmination of high temperature
ep design data — facilities for
h are not adequately available
ndia — has become imperative.
he absence of any reliable data
the capacity of the material to
hstand load, the materials will
find acceptance either in the
nestic or in foreign markets.

Creep testing is a time-con-
ning process: tests last 1 00 000
n some cases. Also, a number
nachines are required at a place
evaluating different types and
s of materials produced. It is
imated that for providing even
liminary creep design data on
ian structural materials at least
creep testing units would be
uired, testing period extending to
r three years or so. To provide
able design data, the scatter in
data will have to be collated
ultimate result obtained to en-
e quality control for obviating
erial failures in service. To
in fairly reliable creep design
it is necessary to test the ma-
als in more than two testing
ratories and record average
es. Assuming even three such
ratories are engaged in this
, a total number of 250 x 3 = 750
units would be required to
ide reliable basic design data.

Creep testing is a costly enter-
e both in terms of specialized
ntific manpower and capital out-
One unit costs up to Rs 50 000
he total cost of 750 such units
d be in the region of about
0 million. In the absence of an
enous source of supply of this
ment and reliable data on the
n materials, such equipment
to be imported and involve considerable amount of foreign exchange.

The Central Mechanical Engineering Research Institute (CMERI), Durgapur took up the development of this specialized equipment with a view to meeting the country's requirements. A furnace and a prototype temperature controller have been built with indigenous material.

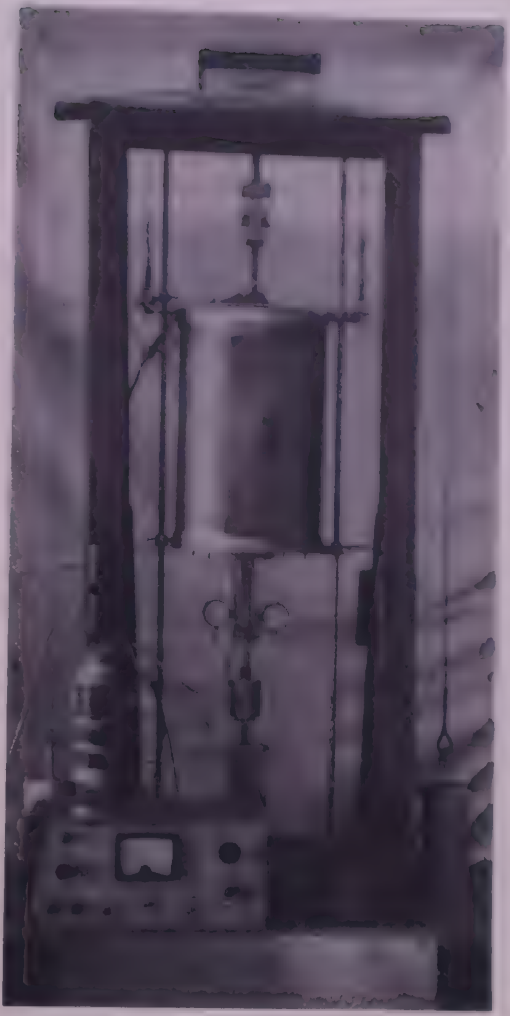
Basic Design

Creep properties depend on three factors, viz. stress, temperature and structure. Hence any equipment designed must give correct load application and control and maintain the temperatures required for the tests. In obtaining creep design data for commercial applications, the strains encountered are often only few interatomic distances per hour. These dimensional changes would also be recorded if the stress application is beyond the limits of a certain accuracy or the temperature fluctuations are of the order of 10^{-4} °C. The recording of these dimensional changes would have to be done by sensitive strain measuring extensometers capable of reading strains up to 10^{-8} in/in. Even with the present sophisticated system it is not possible to control temperature fluctuations to less than ±0.5°C and extensometers with such sensitivity have not been designed. A compromise therefore has to be sought in practical design of the equipment. The necessity for such design has been recommended by the International Organization for Standardization.

The equipment fabricated at the institute has been designed after incorporation of the standards in temperature as well as load tolerances.

The Machine

Made of channel sections the machine is of single lever type. Load is transmitted through a lever on to the lower adapter in which one end of the specimen is screwed by means of a set of coplanar knife edges placed at right angles to each other. Between these knife edges and the specimen holding adapter, a flexible coupling is introduced to minimize errors due to nonaxiality of loading. The top end of the specimen is screwed into another adapter carried in a ball and socket joint which, in its turn, is carried on a threaded spindle resting on a spherical seating on the top plate of the frame. The accuracy of the loading has been determined by an elastic proving ring and found to be within a tolerance of ±0.5 per cent at each load from 100 to 3000 kg. Measurement of strains at diametrically opposite locations of a specimen within the elastic limit showed good tolerances and gave an average ratio of 1:1.03.



CREEP TESTING EQUIPMENT: Designed and developed by CMERI, Durgapur the equipment has the following specifications — capacity, 3 tons; No. of levers, one; lever arrangement, lower location; lever-arm ratio, 1:10; specimen dia., 0.357 in.; gauge length, 2 in. standard or 2 1/2 in; height, 8 ft approx.; and width, 3 1/2 ft approx.

The Furnace

For maintaining uniform temperature along the specimen gauge length, a multizone tubular electric furnace has been designed at the institute and fabricated by a firm. The furnace has uneven windings in its various zones and the power input in each zone can be varied at will, thereby giving a temperature variation not exceeding ±0.5°C at any temperature from 20°C to 1300°C. Except for heating coils, all the materials are of indigenous origin.

Temperature Controller

A proportional temperature controller to control temperature to ±0,5°C has been designed. The controller is undergoing performance tests.

Strain Measurement

For the measurement of strain an extensometer made from a heat-resisting material is attached to the collars provided in the specimen. The distance between the collars defines the gauge length. The extensometer consists of two parallel limbs that extend beyond the length of the furnace used for heating the specimen. Between each pair of limbs a dial gauge calibrated in units of 0.0001 in. is provided. Two extensometers are normally used on diametrically opposite locations.

Cost of Unit

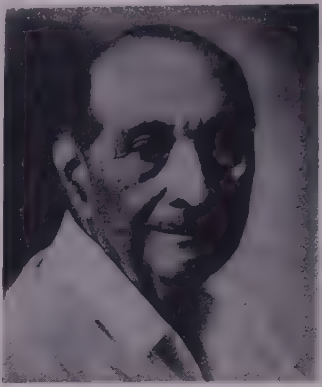
The cost of the creep testing unit consisting of machine, furnace and controller is estimated at Rs 10 000. This includes material cost, labour cost and appropriate overhead charges. The cost of similar items imported into the country and having the same accuracy is some five times this price.

NIO Headquarters Shifted

The National Institute of Oceanography (NIO) which has been functioning from New Delhi will shift to its headquarters in Goa during June-July 1969. Effective 15 July this year the institute will function from the temporary premises: Miramar, Panaji (Goa) (Telephone—2923; Telegram—OCEANOLOGY, Panaji).

Prof. D. N. Wadia

It is with deep regret that we record the passing away of Prof. Darashaw Nosherwan Wadia, National Professor and Geological Adviser to the Government of India and the Atomic Energy Commission in New Delhi on 15 June 1969.



Prof. Wadia was associated with CSIR in several capacities: as Founder-member of the Editorial Board of the Journal of Scientific & Industrial Research; as Member of the Governing Body and Board of Scientific & Industrial Research for several years; as Chairman, Executive Council, National Institute of Oceanography; as Chairman, Indian National Committee on Oceanic Research; as Chairman of the Geological & Mineralogical Research Committee; and as Member of the Executive Council of the National Geophysical Research Institute, Hyderabad.

Born on 23 Oct. 1883, Pr
Wadia was educated at Baro
College, Bombay University.
started his career as professor
geology, Prince of Wales Colleg
Jammu (1907-20). He was with t
Geological Survey of India fr
1921 to 1939. He was also mine
adviser to the Ceylon Governme
till 1944.

Prof. Wadia carried out impo
tant geological surveys of the
Panjal Range, Hazara, Kashm
Himalaya and other areas. He w
author of the book, Geology of Indi
and numerous other papers
mineralogy and structural geolog
particularly Himalayan geology.

He was president, Indian Sc
ence Congress (29th Session, 194
and National Institute of Sciences
India (1945-46). He presided ov
the 12th session of the Internation
Geological Congress held in N
Delhi in Dec. 1964 and was lead
of the Indian delegation to the 1
session of the International Geol
gical Congress in Prague duri
Aug.-Sept. 1968.

A fellow of the Royal Societ
he was awarded the Back Award
the Royal Geographical Socie
London in 1934 and the Lyell Me
by the Geological Society, Lond
in 1943. Prof. Wadia was award
Padma Bhushan in 1958, and b
came the National Professor
1963.

PATENTS

Filed

118744: Refrigerated vessels for maintaining biological tissues and cultures for minimum of 24 hours and maximum up to 48 hours' period for continental and intercontinental despatches, M.V. Bopardikar & V.R. Bhave — CPHERI, Nagpur.

118793: Gas chromatography column selector aid, K. L. Mallik — IIP, Dehra Dun.

118901: Preparation of gamma ferric oxide and a paint containing gamma ferric oxide for the manufacture of magnetic tapes, C. V. Ganapathy, S. M. Khullar & (Mrs) R. Ramachandran — NPL, New Delhi.

118902: A process for the pr
duction of electrolytically deposit
manganese dioxide containing ir
B. P. Varma, J. K. Mukherjee &
Banerjee — NML, Jamshedpur.

Sealed

103959: Improvements in
relating to the manufacture of bon
ed abrasive wheels and shapes,
Bhushan & S. Sen — CGCRI, Ca
cutta.

104525: Lever-roller extens
meter, P.R. Sheorey & B. Singh
CMRS, Dhanbad.

104775: Preparation of a jet-
spillage resistant joint-seal
composition, S. Bagchee & K.
Sachar —CRRI, New Delhi.

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CSIO Releases Directory of Scientific Instruments & Components Manufactured in India

a function held at the Central
ientific Instruments Organization
SIO) on 30 May 1969 at Chandi-
rh, Shri B. P. Bagchi, Chief
mmissioner, Union Territory,
andigarh released the Directory
Scientific Instruments and Com-
nents Manufactured in India,
mpiled and published by CSIO.
is is the first time that such an
thentic and comprehensive re-
rd of the country's production in
e field of instruments has been
ade. Information on about 650
rms and their products is provi-
d in this directory which carries
message from Prof. V.K.R.V.
o, Union Minister of Education
d Youth Services and Vice-
esident, CSIR and a Foreword
om Dr Atma Ram, Director
neral, Scientific & Industrial
search. The publication of the
rectory is timely as the instru-
ent industry in India is growing
ry fast at this time.

In his address, Shri Bagchi
mplimented Dr P.S. Gill, Direc-
r, CSIO on the compilation of this
uch needed, well-indexed direc-
ry, which, besides acting as a
ndy reference tool for the buyers
instruments, will also be of great
lue to those responsible for the
anning and development of the in-
rument industry in the country.

Dr Atma Ram, Director Gene-
l, Scientific & Industrial Research
o presided over the function, sug-
sted that production figures of
rious items should be provided in
e future editions of the directory.

e Directory

e directory is divided into three
rts. Part A — Classified list of
struments and components — lists instruments and components manufactured in the country and the names of the manufacturers. This part is divided into four sections: (1) Optical instruments and components, (2) Electronic and electrical instruments and components, (3) Mechanical instruments, and (4) Other instruments and components. Some specifications of the items listed in the sections 1 to 3 are provided. The names of the firms manufacturing any specific item listed in these four sections are arranged alphabetically. An index for the four sections is provided. Part B lists alphabetically instrument and component manufacturers and Part C lists advertisements and manufacturers' announcements.

The information contained in the directory was collected from the catalogues of instrument manufacturers, and supplemented by the information collected by the scientists of CSIO through visits to the major centres of instrument manufactures in the country and also from a questionnaire sent out to various firms. Useful information regarding manufacturing capacity of some medium and large-scale units registered with the Directorate General of Technical Development has also been incorporated.

The 700-odd page (demy 4to) directory is priced Rs 30.00. As

On the occasion of the release of the Directory of Scientific Instruments and Components Manufactured in India and inauguration of the Prototype Centre at CSIO, Chandigarh — (from left) Shri B.P. Bagchi, Dr Atma Ram, Dr M.S. Randhawa and Dr D.G.A. Butaev, Director, Field Operations, Unesco, New Delhi

Dr Gill, Director, CSIO has pointed out in his preface, the directory fulfils in part one of the aims and objectives of CSIO, viz. to survey and assess the present and future needs of various types of scientific instruments required for teaching, research and industry, including essential services, and to collate and coordinate all available information on the subject in the country'.

CSIO Prototype Centre Inaugurated

The Prototype Centre of the Central Scientific Instruments Organization (CSIO), Chandigarh was inaugurated by Dr M.S. Randhawa, Vice-Chancellor, Punjab Agricultural University on 30 May 1969.

Speaking on the occasion, Dr Randhawa expressed the hope that in times to come industry would come forward in a big way to take advantage of services offered by CSIO, and that the organization would be able to discharge its functions more effectively.

In his address, Dr P. S. Gill, Director, CSIO, pleaded for support in making it easier for the organization to pass on the technical know-how to the instrument industry. Dr Gill said that CSIO should be aided to set up a batch production unit, which would facilitate the transfer to industry of instruments developed.

Prototype Centre

Working models of all the instruments, components and machinery developed at CSIO are displayed at the centre to enable the entrepreneurs to select the instrument which they could take up for commercial production. Industrial models of the instruments in regular production are also exhibited at the centre.

In the field of optics, the development work has been concentrated more on projection and micro-optics, using indigenous optical glass manufactured by the Central Glass & Ceramic Research Institute, Calcutta. The commercial viability of the designs developed at CSIO has been examined at a pilot plant sponsored by Laboratory Equipment Traders, Ambala Cantt, which has set up a new unit for the production of precision optics. Another pilot plant for production of optics, sponsored by Unique Trading Corporation, Bombay, is presently in operation at its unit at Udhna, Surat dist. Process camera prism and visual colorimeter prism, have been developed at the instance of Monotype Corporation, Bangalore and Oriental Science Apparatus Workshops, Ambala Cantt respectively. Work on the development of an optical pyrometer and a flame photometer has been sponsored by Photo Electric Instruments, Jodhpur. A number of opto-medical instruments, e.g. corneal loupes, retinoscope and skiascope, have been developed and ophthalmoscope and focimeter have also reached the laboratory prototype stage. Some optical testing instruments have also been developed which include ring spherometers, interference viewer, optical spherometer and fizeau interferometer. Work has also been initiated on the development of important optical components, and some of those already developed include half and quarter wave plates, quartz compensator I to IV order, gypsum I order red plate, crosslines, stadia and micrometer graticules. For carrying out the operations of grinding, polishing and curve generation some optical glass working machines have also been developed and are in production at the Laboratory Equipment Traders, Ambala Cantt.

In the field of medical electronics which has remained practically fallow in the growth of the indigenous instruments industry, a number of instruments have been developed in consultation with the Post-graduate Institute of Medical Education & Research, Chandigarh. These include stimulators of various types, low-level pre-amplifier, telethermometer, cardioscope, cardiac pace maker, ac defibrillator, pulse monitor, blood drop chamber and counter. Some of these have already been put into production by Instruments & Chemicals Pvt. Ltd, Ambala.

A number of electronic instru
ments using the digital techniqu
evolved at CSIO have also been d
veloped. These include deca
scaler, counter / frequency mete
preset counter, electronic timer a
timer/counter of which the fir
two have gone into production
Oriental Science Apparatus Work
shops, Ambala Cantt. This fir
has also taken up the production
two more instruments, viz. stab
lized dc power supply and high vo
tage power supply, developed at th
organization. A technique for in
line read-out, to replace the dis
play in columns, has also been de
veloped, for use in the digital elec
tronic instruments.

In the field of industrial instru
ments, an on-off controller fo
use in pyrometric millivoltmete
and other types of indicating in
struments have been develope
at the instance of the Instru
mentation Ltd, Kota. Therma
instruments like multipoint tem
perature indicator, differentia
thermometer and lead compensate
temperature indicator have als
been developed. Servo-component
like servomotor and precision po
tentiometer have also been de
veloped for use in potentiometri
recorder which is under develop
ment. Other industrial instrument
that have been developed include
FET chopper amplifier and an em
current converter.

An electronic temperature con
troller and a suppressed zero volt
meter have also been develope
primarily for the testing, calibra
tion and standardization laborator
of CSIO.

A moisture meter for determi
nation of moisture content in fo
grains has been developed by CSI
in collaboration with Oriental Sc
ence Apparatus Workshops, Amba
Cantt. A dial indicator and
average-type tachometer have als
been developed at the instance
Amar Machine Tools.

A number of instruments hav
also been developed at the two de
velopment centres set up by CSI
at the premises of Oriental Scienc
Apparatus Workshops, Amba
Cantt, and Instruments & Chemica
Pvt. Ltd, Ambala. Some of thes
also find a place in the Prototy
Centre of CSIO.

BIOCHEMICALS FOR RESEARCH

CSIR Unit at V.P. Chest Institute Offers 102 Items

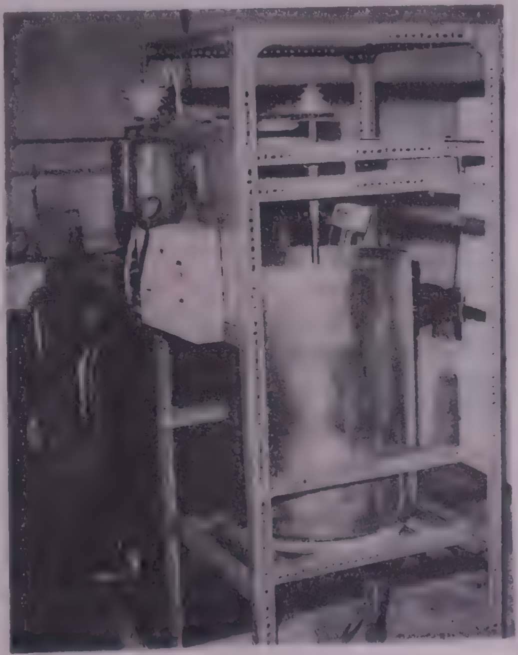
pply of quality biochemicals has en a difficulty faced by Indian ochemists as well as scientists in lated fields. With the progres- vely difficult foreign exchange tuation, research work in many boratories, universities, industries d research organizations has been mpered. It has been the experi- ce of many scientists that even hen they arrange for import of me of the more labile chemicals om abroad, by the time these are ansported to India, cleared through e customs and are received in the boratories there is a considerable terioration in their potency. The tablishment of the Biochemicals nit has thus filled a long felt need this respect.

The Biochemicals Unit located V.P. Chest Institute, Delhi was tablished in April 1966 for the reparation of biochemicals, follow- g the recommendations of expert mmittee appointed by the Director eneral, Scientific & Industrial Re- arch. The committee was to ad- se the Council on the setting up of pilot project for the preparation biochemicals and to suggest a ased programme with details of nportant raw materials required r the project, the location, as well requirements in respect of equip- ent, building and staff. Based on e replies to a questionnaire sent to er 300 institutions, the committee ecommended the establishment of a nit and submitted a detailed report sting biochemicals that should be ade in India, some information on eparative procedures, equipment, w materials, etc. The Officer-in- harge appointed by CSIR to estab- sh this unit recommended that it ould be located in a university in der to obtain better administrative ficiency and the offer of the Vice- hancellor, University of Delhi to tablish this unit at V.P. Chest stitute, Delhi was accepted by SIR.

bjectives

large number of biochemicals are quired in India in relatively small antities. The shelf-life of most biochemicals is comparatively short. Heavy overheads of equipment, skilled labour and developmental expenses mean that such a unit cannot be an economically viable one, and hence, the above committee specifically mentioned that it should be established as a service to scientists rather than a financially self-supporting entity.

The preparation of some compounds presents special difficulties in India. For example, the two main classes of raw materials required in the preparation of many biochemicals, namely, fresh animal tissues and yeast are not easily available. It is also difficult to prepare on a competitive basis some of the chemicals which come out as byproducts during the preparation of other products requiring expensive equipment and automation. On the other hand, certain other classes of compounds where this country has a geographical advantage (e.g., snake venoms), compounds which require skilled labour (phospholipids, certain enzymes) can be competitively made in India for the export markets. The Biochemicals Unit has aimed at a dual role of import substitution as well as export promotion.



Multipurpose stainless steel reaction vessel locally fabricated for preparation of biochemicals

Superspeed Sharples centrifuge for continuous centrifugation installed at the Biochemicals Unit

In addition to the chemicals used in research, the Biochemicals Unit has started work on the isolation of compounds which would have a potential in diagnosis, treatment and as a starting material in the pharmaceutical industry. The unit will ultimately offer some of the processes developed to industry for commercial exploitation.

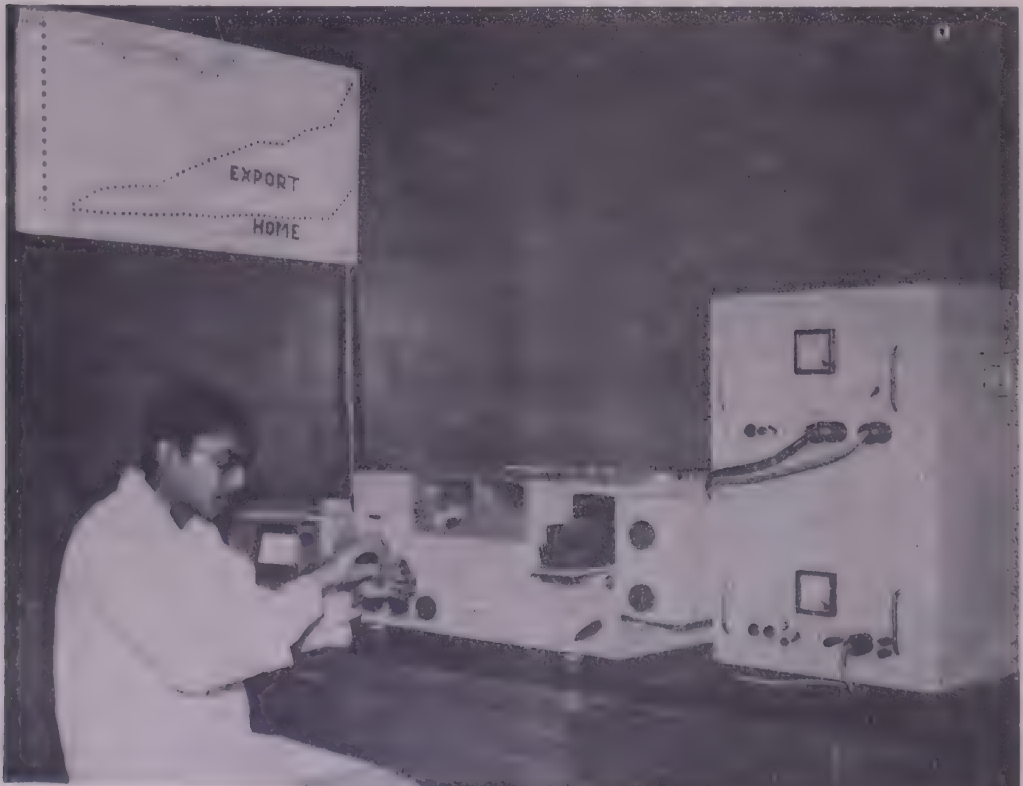
Biochemicals Produced by the Unit

The first list of biochemicals containing a dozen items was circulated to potential users in April 1967. Most of the compounds included in this list had to be chosen in view of the equipment that could be gathered during the first year. Making use of the facilities available in the workshop of the V.P. Chest Institute, the staff of the unit successfully fabricated several items of equipment. Notable among these is the fabrication of a freeze drying unit which uses a solid CO_2-methanol cooling mixture. A second list containing 70 chemicals was circulated in December 1967. The sales figures in the first two years of marketing show an impressive record of export. During 1967-68 (the first year of marketing) the total sales were about Rs 92 000 of which exports constituted about Rs 56 000. During the year 1968-69 (the second year of marketing) the total sales were Rs 1.62 lakhs of which exports constituted Rs 1.02 lakhs. The exports were mainly to USA and UK. The third list circulated in February 1969 includes 102 compounds along with specifications and prices.

The preparation of a diverse range of biochemicals under the same roof is a formidable task and would require skills in several disciplines. Even in the advanced countries, commercial establishments offering a comprehensive range of biochemicals can at best prepare 10 to 20% of the listed compounds on their own premises. The preparation of some compounds requires specialized (and expensive) equipment in addition to the skills and whenever the turnover of these products is small the preparation becomes highly uneconomical. A preliminary review of the skills and facilities available in different Indian laboratories has indicated that there is a considerable scope for exploiting these in the preparation of compounds needed in several other laboratories. The unit proposes to organize additional centres where a limited range of compounds can be made on behalf of the unit for subsequent quality control and distribution.

Specially designed moistureproof glove box for subpacking hygroscopic biochemicals

Spectrophotometric analysis of chemicals prepared for inclusion in the data sheet which accompanies every product shipped



Quality Control

Biochemicals are relatively ve expensive (for example, two of enzymes isolated from snake ven are included in the unit's lat price list at as much as Rs 20 5 mg). The experiments in wh the biochemicals find use normally planned in an elabor manner and the use of any su standard chemical is bound to r sult in wastage of substantial su of money. Quality control of chem cals offered for sale thus is a ve important facet of the activities the unit. In the Biochemicals U a completely separate and indepe dent section of quality control ha therefore, been established.

The unit offers an excell example of a cooperative vent between a university and a gover ment department.

List and Specifications of Biochemicals Prepared by the Un

1 Acetoacetic acid, lithium s
Single spot on paper chrom tography

2 Acetyl phosphate, dilithi salt
Purity approx. 70%

Adenosine-5'-triphosphate
Purity approx. 60%

Agar — shreds, powder

Albumin, bovine
Cohn fraction V, lyophilized

D-Amino acid oxidase

L-Amino acid oxidase
0.2 to 0.3 IU/mg
Substantially free from contaminating enzymes

Ammonium sulphate
Enzyme grade

β-Amylase (ex-sweet potato)

Amylopectin (ex-potato)
Stable white powder

Amylose (ex-potato)
Stable white powder, substrate for amylase estimation

4-Androsten-3,17-dione(androstenedione)
Single spot on TLC

4-Androsten-17α-methyl-17β-ol-3-one (methyltestosterone)
Single spot on TLC

4-Androsten-17β-ol-3-one(testosterone)
Single spot on TLC

4-Androsten-17β-ol-3-one acetate (testosterone acetate)
Single spot on TLC

4-Androsten-17β-ol-3-one propionate(testosterone propionate)
Single spot on TLC

5-Androsten-3β-ol-17-one (androstenolone, dehydroepiandrosterone)
Single spot on TLC

5-Androsten-3β-ol-17-one acetate (androstenolone acetate, dehydroepiandrosterone acetate)
Single spot on TLC

Beef extract
Bacteriological grade

Bile, desiccated

Brucine sulphate
Conforms to N. F. IX

Cardiolipin (0.5 - 1.0 mg/ml-amp)
Reference standard for TLC

23 Casamino acids
Bacteriological grade

24 Casein (fat free)
Useful in diets for laboratory animals

25 Catalase (ex-buffalo liver)
Suspension with thymol as a preservative; activity approx. 200 units/mg

26 Cellulose, powder
Adsorbent for TLC

27 Cellulose, powder
Mesh 100-240

28 Cellulose carboxymethyl (CM cellulose)
Mesh 100-120

29 Cellulose-ecteola

30 Cellulose, phosphorylated

31 Cerebrosides (ex-buffalo brain)
TLC shows predominant double spot

32 Cholesterol, pure

33 Cholesterol, crystalline
Single spot on TLC

34 Cholesterol acetate
White crystalline powder

35 D-Citramalic acid

36 DL-Citramalic acid

37 L-Citramalic acid

38 Cyanmethemoglobin
Standard for Hb estimation-

39 Cytochrome-C(ex-buffalo heart)
Lyophilized powder; Fe, 0.34%

40 o-Dianisidine

41 Egg-albumen (ex-chicken egg)
Dry powder

42 Fructose-1,6-diphosphate, dibarium salt
Purity approx. 75%, aldolase active

43 D-Galactose

44 Glucose-1-phosphate, dipotassium salt
White crystalline powder free from inorganic P and reducing sugars

45 Glucose-6-phosphate, barium salt

46 L-α-Glycerophosphoryl choline ($CdCl_2$ complex)
White crystalline powder chromatographically pure

47 Glycogen (ex-rabbit liver)
Fine white powder with a purity of approx. 90%

48 Heart brain infusion
Bacteriological grade

49 Hyaluronic acid, potassium salt (ex-umbilical cord)

50 Hyaluronidase

51 Ls-Isocitric acid lactone
Substrate for isocitric dehydrogenase

52 Lecithin (ex-chicken egg)
Yellowish brown waxy material containing egg phospholipids

53 L-α-Lecithin (ex-chicken egg) (1g/10 ml hexane)
Yellowish solution; gives single spot on TLC; ideal substrate for phospholipases

54 Lysolecithin (ex-egg lecithin)
White crystalline powder; gives single spot on TLC

55 Lysophosphatidyl ethanolamine
Lyophilized, off-white powder gives single ninhydrin positive spot on TLC

56 Methyl linoleate
Purity approx. 99%

57 Methyl oleate
Purity approx. 99%

58 Methyl palmitate
Purity approx. 99%

59 Methyl stearate
Purity approx. 99%

60 Nicotinamide adenine dinucleotide (NAD, DPN)
Purity approx. 95%

61 Nicotinamide adenine dinucleotide, reduced (NADH, DPNH)
Purity approx. 95%

62 o-Nitrothiophenyl-β-D-galactoside

63 5'-Nucleotidase
1 mg hydrolyses 10 μ moles of 5'-AMP per min at 37°C

64 Ovalbumin-5X
Crystallized and lyophilized
Salt free

65 Ovomucoid (trypsin inhibitor)
1 mg inhibits 0.8-1.0 mg of trypsin

66 Oxalacetic acid
Buff coloured powder

67 Pancreatin (ex-hog pancreas)
Lyophilized

68 Papain, crude

69 Papain
Lyophilized, electrophoretically pure

70 Peptone
Bacteriological grade

71 Peroxidase (ex-horse radish)

72 Phenyl-α-D-galactopyranoside

73 Phosphatidic acid, sodium salt (ex-egg lecithin)
Lyophilized
Reference standard for TLC

74 Phosphatidyl ethanolamine
Lyophilized

75 Phosphatidyl ethanolamine
1:0 ml amp; reference standard for TLC

76 Phosphodiesterase (ex-Russell's viper venom)
1 mg hydrolyses 0.2-0.5 μ moles of bis-p-nitrophenyl phosphate per min at 37°C
Substantially free from contaminating enzymes

77 Phospholipase A
1 mg hydrolyses 0.3-0.5 μ moles of lecithin per min at 30°C
Substantially free from contaminating enzymes

78 Phospholipase B

79 Phospholipase D

80 Pituitary acetone powder

81 Plasma or serum cat (lyophilized)
Each amp contains material equivalent to 1 ml of plasma of serum

82 Plasma or serum dog (lyophilized)
Each amp contains material equivalent to 1 ml of plasma of serum

83 Plasma or serum guinea-pig (lyophilized)
Each amp. contains material equivalent to 1 ml of plasma or serum

84 Plasma human (lyophilized)
Each amp contains material equivalent to 1 ml of plasma

85 Plasma or serum rat (lyophilized
Each amp contains material equivalent to 1 ml of plasma or serum

86 5,16-Pregnadien-3β-ol-20-one acetate (16-dehydropregnenolone acetate)
Single spot on TLC

87 4-Pregnen-3,20-dione (progesterone)
Single spot on TLC

88 4-Pregnen-17α-ol-3,20-dione (17-α-hydroxyprogesterone)
Single spot on TLC

89 5-Pregnen-3β-ol-20-one (pregnenolone)
Single spot on TLC

90 5-Pregnen-3β-ol-20-one acetate (pregnenolone acetate)
Single spot on TLC

91 Rabbit heart acetone powder

92 Rabbit kidney acetone powder

93 Ribonucleic acid (ex-yeast)
Purity approx. 80%

94 Sodium tauroglycocholate

95 Sphingomyelin
Fine white powder; gives a typical double spot on TLC

96 Starch, hydrolyzed
For gel electrophoresis

97 Starch, potato

98 Strychnine

99 Strychnine sulphate, crystalline

100 Thromboplastin (ex-rabbit brain) lyophilized
Useful for the estimation of prothrombin time

101 Venom-naja naja (hooded cobra) lyophilized

102 Venom-Vipera russeli (Russell's viper) lyophilized

Studies in Triterpenes

Stereochemical and rearrangeme studies in triterpenes have bee carried out by Shri T. B. Samant research fellow, working at th Indian Institute of Experiment Medicine, Calcutta.

Nonalkaloidal constituents isc lated from Alangium lamarckii Th (Alangiaceae) included betulin acid, betulinaldehyde, betulin ar lupeol, showing a remarkable bic genetic sequence, along with hydrc xylactone A and β-sitosterol. Cor figuration studies of the hydroxy lactones derived from betulinic ac under various acidic conditions hav shown that the C-3 hydroxyl grou in both betulinic acid and hydroxy lactone A is β-equatorial whil hydroxyl group is α-axial in hydrc xylactone B. Sodium borohydric or sodium-alcohol reduction of th ketolactone was found to lead pre dominantly to the less stable axi alcohol, plausibly by conformation transmission effect peculiar to thi ketolactone system. This is th first observation of an alkali met and metal hydride furnishing th thermodynamically less stabl alcohol, a rare phenomenon triterpene chemistry.

Acid-induced epimerization ha also been shown in arborinol → iso arborinol, the epimeric pair of tri terpenes isolated in this laborator While arborinol was epimerized iso-arborinol and its acetate unde the acidic conditions (AcOH:H_2SO H_2O::50:1:1) along with two minc rearranged products, viz. iso-arbc renene I and iso-arborenene II, isc arborinol was recovered unchange under the same condition. This the first instance of epimerizatic of an axial alcohol to the mor stable equatorial one under acidi conditions.

The researcher Shri Samant who carried out the studies unde the guidance of Dr S. C. Pakrash was awarded the D. Phil. degree the Calcutta University (1969).

Doctorates

Shri T. R. Tyagi, NPL, Ne Delhi — Ph. D. (Delhi Universit 1969); thesis: A satellite rad beacon study of the ionospher (Guide: Dr A. P. Mitra).

CEERI Developed dc Position Control Servosystem Ready for Commercial Development

system is a third order posi- ng servomechanism consisting transistorized para-phase dc oamplifier feeding a split-field ervomotor coupled to a posi- feedback servopotentiometer ugh a gear train. It is stabili- by the use of a feedback com- ating unit consisting of a tacho- rator directly coupled to the or shaft and connected in series a suitable network which can djusted to obtain a desired per- nance characteristic.

The unit has been designed and icated by the Central Electro- Engineering Research Insti- Pilani for serving as a wor- model for advanced design and lopment work in the field of rol systems engineering.

The system consists of the wing plug-in modules (using ted boards for all electronic uits): (1) dc servoamplifier ule; (2) regulated power supply ule (+ 30 V; max.load current, mA); (3) regulated power supply ule (-30 V; max. load current, mA); (4) constant current rator (200 mA; nominal load ohm; rated load current, 195 ; and (5) servomount.

The specifications of the servo- lifier (fed from two power supply modules + 30 V at 100 mA and -30 V at 500 mA level) are: input impedance, 80 kohm; output impedance 100 ohm; random drift at constant temperature, < ± 100 μV; voltage gain (with load), 1000 approx.; and power gain (with load), 70 db approx. The servomount consists of a dc split-field servomotor and a dc tachogenerator coupled directly to the motor shaft and the servopotentiometer coupled through a spur gear reduction mechanism having a ratio of 4.53 (N_1 = 32; N_2 = 145).

The essential test equipment consists of (i) electronic voltmeter (0-150 V with different ranges; input impedance, 1.5 meg ohms (min.); minimum range, 0-100 mV FSD; and (ii) LF oscilloscope bandwidth, 100 kc/s; sensitivity, 30 mV/cm).

The cost of components required is estimated at Rs 1250, out of which imported components account for Rs 225. Some of the imported components are available through local dealers and suppliers.

Firms interested in undertaking the commercial development of the device may correspond with the Secretary, National Research Development Corporation of India, Mandi House, Lytton Road, New Delhi 1.

osition Control Servosystem designed and fabricated by CEERI, Pilani. Serves as a ing model for advanced design and development work in the field of control systems engineering

Honours & Awards

Dr M. Swaminathan, Chairman, Applied Nutrition and Dietetics Discipline, Central Food Technological Research Institute, Mysore has been awarded the Honorary Membership of the American Institute of Nutrition in recognition of his distinguished contributions to nutrition. He is the second Indian nutritionist to get this recognition, the first being Dr V.N. Patwardhan, former Director of the Nutrition Research Laboratories, Hyderabad. Dr Swaminathan has worked on several aspects of applied nutrition and dietetics, such as substitute and supplementary foods, mutual and amino acid supplementation of proteins, infant foods and processed protein foods suitable for the prevention and treatment of protein malnutrition in preschool children.

Deputations

Shri C.V. Gangadhara Reddy, Scientist, National Institute of Oceanography left for UK on 2 May 1969 for 3 months' specialized training in chemical oceanography at the University of Liverpool under the exchange programme between CSIR and the British Council.

Shri K.D. Sharma, Director, Central Glass & Ceramic Research Institute, Calcutta left for UK and USA on 3 May 1969 to visit research centres and glass industries in these countries under the exchange programme between CSIR and the British Council and Indo-US exchange of scientists agreement.

Visitors

Prof. N. Fusamura, Waseda University, Shinjuku-ku, Tokyo visited the Central Mining Research Station (CMRS), Dhanbad on 15 and 16 May 1969. Prof. Fusamura in his discussions with the scientists of CMRS referred to the problem of asbestosis which exists in Canada as well as India. He also delivered a lecture at CMRS (16 May) on dust and radioactive gas hazards in uranium mines and the extent of danger from different decay products of radon. Earlier in 1967, Dr Fusamura was at CMRS for three months for studies on colliery and mine fires in India.

Indo-Soviet Technological Collaboration

A delegation of the USSR Committee of Science and Technology visited India at the invitation of CSIR. The Soviet delegation visited research institutions and industrial establishments in Delhi, Ahmedabad, Poona, Bombay, Bangalore, Madras, Calcutta and Jamshedpur from 28 May to 16 June 1969.

The Soviet delegation comprised Academician Sergei A. Khristianovich, member of the Board of the Committee (head of delegation); Dr Givi Sh. Mikeladze, Chairman of Committee for Science & Technology of the Georgian Council of Ministers; Dr Fakhmutidin Khodjaev, Minister for Light Industries of the Uzbek Republic; Dr Vladimir A. Malyussov, Corresponding Member of the USSR Academy of Science (Chemistry); Dr Nikolai A. Berdennikov, Dy Director of Foreign Relations Department of State Committee of the USSR Council of Ministers for Science and Technology; and Dr Yuri A. Atanov, Head of the Laboratory of National Research Institute for Physical and Radiotechnical Measurements.

During the three weeks' stay in India, the Soviet delegation met Dr V.K.R.V. Rao, Minister of Education & Youth Services and Vice-President, CSIR. They had discussions with Indian scientists including Dr Atma Ram, Director General, Scientific & Industrial Research, Dr B. D. Nag Chaudhuri, Member (Science), Planning Commission, Dr S. Bhagavantam, Scientific Adviser to the Minister of Defence; Dr D. S. Kothari, Chairman, University Grants Commission; and directors of some national laboratories and industrial research associations.

The Soviet and Indian delegations broadly identified tentative areas in which they could collaborate, such as textile technology, chemicals, high polymers, petrochemicals, dyestuffs, glass and ceramics, leather technology, ore processing, ferro-alloy technology and jute technology.

The Soviet Government has extended an invitation to Dr Atma Ram to head an Indian delegation to visit USSR for further discussions to collaborate in the field of applied science and technology.

The Soviet delegation during their visit to the Indian Jute Industries Research Association (IJIRA), Calcutta on 12 June 1969 being explained investigations on retting and extraction of jute –(from right) Dr Khodjaev, Dr Atanov, Academician Khristianovich (leader), and Dr Berdennikov

Dr A.K. De

Dr Arun Kumar De, Professor a Head of Department of Mechanic Engineering, Indian Institute Technology, Bombay, assum charge as Director, Central Mecha nical Engineering Research Institut Durgapur on 6 May 1969.

Born on 2 Nov. 1925 Dr received his early education Calcutta and after graduation mechanical engineering in 19 from the College of Engineering a Technology, Jadavpur, had indu trial training at the Jay Engineeri Works Ltd, Calcutta during 1947-4 followed by advanced training in from 1949-51. On completion of t training Dr De served the Jay Eng neering Works as a Developme Engineer till 1958. The same ye he joined the Indian Institute Technology (IIT), Bombay as assistant professor. It is mos due to his initiative and drive th the master's degree course machine tools engineering w started at IIT, Bombay in 1960. 1962 he proceeded to USSR a worked with Prof. N.S. Acherk in the Machine Tools and Sm Tools Institute, Moscow for doctorate degree. On his retu he was appointed Professor a Head of Mechanical Engineer Department at IIT, Bombay.

Dr De has specialized in p duction engineering and mach tools and has to his credit a num of research papers dealing w machine tool rigidity and its me urement, dynamic errors in me cutting operation, static rigidity bed plate, static rigidity of la beds by model analysis, rigi characteristics of clamped colu and shaping machines, etc., effect of cutting fluids on tools we

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Symposium on 'Low Cost Waste Treatment'

The Central Public Health Engineering Research Institute, Nagpur is organizing a symposium on 'Low Cost Waste Treatment' in Nagpur from 27 to 29 Oct. 1969 (*CSIR News*, Vol. 19, p 97).

The objective in any waste water treatment scheme is the removal and stabilization of colloidal and suspended solids and stabilization of the dissolved organic materials. There are several low cost waste treatment processes which have become popular in other countries during the last 10 years. In India, excepting stabilization ponds (oxidation ponds) no other low cost waste treatment devices have become popular. Recourse is still made to the conventional treatment process like activated sludge and bio-filtration to treat the liquid wastes in all cases. Depending upon the quality and quantity of waste there is for every situation an ideal solution which is most economical to adopt. For example, the stabilization pond is ideal for small flows where ample land is available. The aerated lagoon is more suitable for middle-sized towns; the Pasveer-type oxidation ditches are equally favourable for small as well as middle-sized towns and suburban areas of large cities where land is scarce and expensive. There is no universal solution applicable to all types of situations.

Some 40 papers spread over seven sessions will be presented and discussed at the symposium which will review the existing knowledge on low cost waste treatment with emphasis on the available Indian know-how. Important design principles, construction and operational details and economics of the various waste treatment processes will be discussed at the symposium. The symposium is expected to help practising engineers and scientists to successfully introduce into India the various low cost waste treatment facilities which could be profitably used for reducing the pollution of natural water resources and thereby protect public health.

Dr A. Pasveer of the Public Health Engineering Research Institute, Delft, Netherlands, a specialist responsible for the development of oxidation ditches, will be participating in the symposium. Participants from nine other countries will also be attending the symposium under the auspices of the World Health Organization.

Low Cost Waste Treatment : CPHERI's Achievements

Waste Stabilization Ponds

These are artificial or natural basins of waste water in which sewage and other organic waste water are rendered stable and inoffensive for discharge into receiving water or on land, through physical, chemical and biological processes, commonly referred to as 'self-purification', involving the action of algae and bacteria under the influence of sunlight and air. In the stabilization ponds, the objective of making the waste innocuous and inoffensive can be accomplished with minimum of maintenance and operation costs.

The Central Public Health Engineering Research Institute (CPHERI), Nagpur has made concerted efforts to popularize ponds in India. The ponds are relatively new tools in the hands of public health engineers awaiting wider and newer applications with confidence. The institute has

Institute's stabilization ponds at Bhandewadi, Nagpur recently brought out a manual, 'Design, Construction and Operation of Waste Stabilization Ponds in India' which gives recommended BOD loading under varied climatic conditions along with the cost of pond construction, land area requirement and various other details. Today there are about 40 installations operating successfully in the country. If the simple guide for operations to determine the conditions of a pond given in the manual is followed the pond operation becomes so simple that even unskilled persons can maintain and run the ponds successfully. The stabilization pond method of treatment is equally efficient, though not more efficient than the conventional sewage treatment plant which costs much more. Stabilization ponds have proved to be good for elimination of pathogenic bacteria from sewage.

Pasveer-type oxidation ditch in the CPHERI campus

Anaerobic Ponds

Due to industrial developments in several urban and other communities the land costs have increased, as a result of which it may be difficult to use stabilization ponds for treatment of sewage and other organic wastes in such situations. One means of reducing the area required for use of stabilization ponds is to use anaerobic-facultative or anaerobic-aerobic pond systems. The existing reported ratios of area requirements in other countries between aerobic and anaerobic units are 10:1 and 5:1. Studies conducted on pilot plant scale at CPHERI have so far indicated the ratios to be approximately 11:1. However, further investigations are necessary to arrive at proper design criteria for Indian conditions.

Mechanically Aerated Lagoons

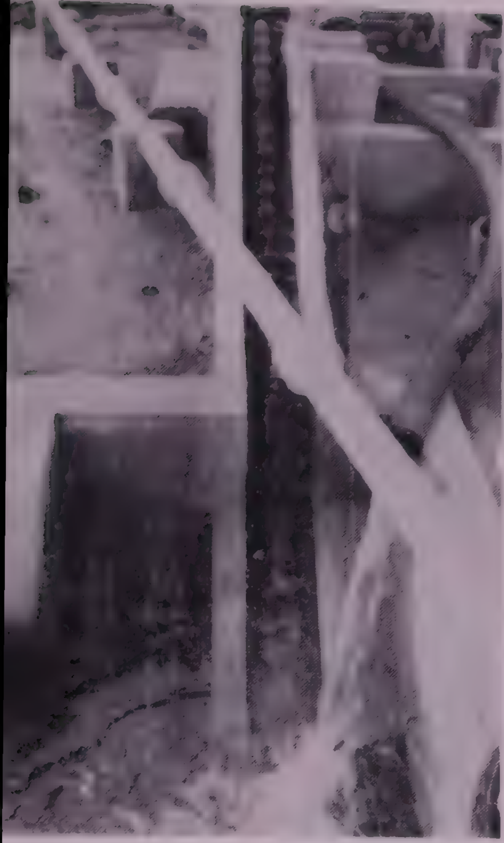
In the conventional activated sludge process sufficient aeration is done to maintain aerobic conditions during the treatment, and the culture substrate constitutes a small floc of particles of decomposing organic matter and bacteria.

In all the processes a suitable environment must be provided to stimulate the growth and reproduction of a biological community. Nutritional requirement is a must for maintaining good biological populations. The 5-day biochemical oxygen demand or the demand for dissolved oxygen by the microorganisms in a period of 5 days to oxidize the organic matter forms the main parameter for evaluating the reduction of objectional organic matter to an inoffensive and non-putrescible state which is generally termed purification.

For the design of biololgical oxidation systems, the BOD$_5$ removal characteristics, oxygen utilization, oxygen transfer and aeration, solid-liquid separation, pH and temperature effects and nutritional requirements form the major considerations. The aeration of the waste could be carried out either by mechanical aerators or by sending diffused air into the liquid waste with the help of compressed air.

A pilot plant has been installed at Nagpur. The plant is capable of treating 25 000 gal per day of

Mechanical aerator fabricated at CPHERI



A screw pump in operation

raw municipal sewage. The aerator unit has been fabricated at the institute.

Pasveer-type Oxidation Ditches

Oxidation ditches are shallow, circular or oval earthen ditches, concrete lined or brick lined, which use a rotor or aerator to provide oxygen and circulation. The oxidation ditch is similar to a complete mixed activated sludge plant except that the solids under aeration are kept at higher levels, i.e. the basic design s evolved on the principle of extended aeration and it is a closed circuit system followed by a clarifier with a sludge return facility.

In the Pasveer-type oxidation ditches (extended aeration process) the raw waste is aerated for a sufficient ength of time by prolonged aeration bringing about conversion of the organic matter into microorganisms which are removed from the effluent by sedimentation. The sedimented solids from the sedimentation basin are returned or recycled as return sludge by feeding to the raw waste. This eliminates the need for primary edimentation and sludge digestion, which reduces both capital costs and operational problems.

The institute has installed a pilot plant with a capacity of 40000 gal/day to treat domestic sewage. The cage rotors for aerating the ditch have been designed and fabricated at the institute. Results obtained so far have indicated that oxidation ditches have a greater potential for treating not only the sewage but also the industrial wastes, such as phenolic, strawboard and paper mill wastes.

Screw Pumps

Archimedian screw pumps have been used in European countries quite extensively for pumping sewage and sludges. They are particularly useful for pumping variable flows over low heads. They have high efficiency over a wide range of flows and eliminate the need for wet wells and pump-houses.

In order to popularize their use in India, the first unit has been fabricated by CPHERI in its own workshop and operating experience so far has been quite encouraging.

Aerated Lagoons

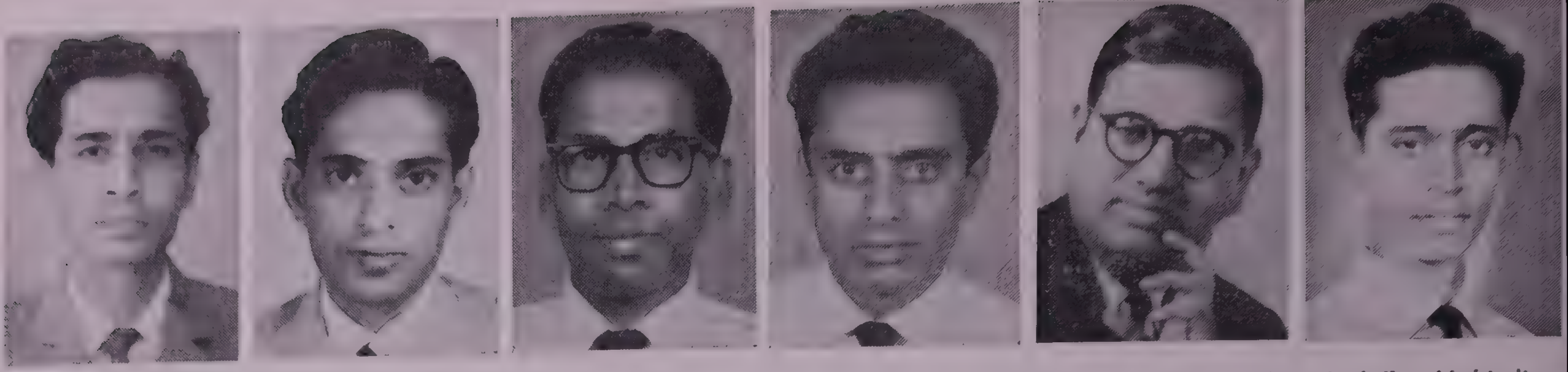
Aerated lagoons are ponds 8 to 12 ft deep having a geometric configuration and remain aerobic all through their operation with the help of diffused aeration or surface aerators. This process does not involve sludge recycling or primary treatment or sludge digestion in separate digesters and purification of the waste could be brought about within relatively short periods of 2 to 3 days compared to 7 to 10 days for natural stabilization ponds.

The system maintains the dissolved oxygen all through the lagoon. This condition keeps the system free from odour and fly nuisance. When compared to a stabilization pond, the area requirement for the system is very little and the work carried out by the institute has shown that the area required varies from 1/6 to 1/10 of the land required for a stabilization pond for the same flow and conditions.

Floating Aerators

The institute has embarked on a programme of developing floating aerators which could be made available to the public in standard sizes of 5, 10 and 25 hp models. Sewage treatment could then be simplified to a great extent, needing the municipality or organization to install such floating aerators in simple earthen excavations of appropriate size without any concrete or masonry construction. This would make the units really low cost facilities and permit easy expansion, modification, etc. in future as the townships develop.

An aerated lagoon (with mechanical aerator) in the CPHERI campus



Award Winners (from left): Dr H. R. Chipalkatti, Shri V. Gopalakrishna, Shri H. S. Prabhakara Sastry, Shri M. Jaffer Mohiadin, Dr N. Ramanathan and Shri S. Ananthanarayanan

Invention Awards to CSIR Scientists

Three inventions made by scientists in CSIR laboratories and industrial research associations have been awarded cash prizes by the Inventions Promotion Board which announced its Independence Day awards on 15 August 1969. The recipients of the awards are: (1) Dr H. R. Chipalkatti, Deputy Director, Ahmedabad Textile Industry's Research Association, Ahmedabad for developing a process by which cotton, rayon or polyester cloth does not require pressing after wash (award of Rs 1000); (2) Sarvashri V. Gopalakrishna, H. S. Prabhakara Sastry and M. Jaffer Mohiadin, National Aeronautical Laboratory, Bangalore for developing a filament winding machine used in petroleum and chemical industries (joint award of Rs 600); and (3) Dr N. Ramanathan and Shri S. Ananthanarayanan, Central Leather Research Institute, Madras for developing an electrical microbalance for laboratory use (joint award of Rs 500).

A brief account of the inventions follows.

Permanent Press Process

Permanent press garments and clothing are those that are specially treated so that they: (1) come out after drying ready to be put on without pressing; (2) hold sharp creases and pleats in spite of repeated washing; and (3) are highly resistant to wrinkling and musing during wear.

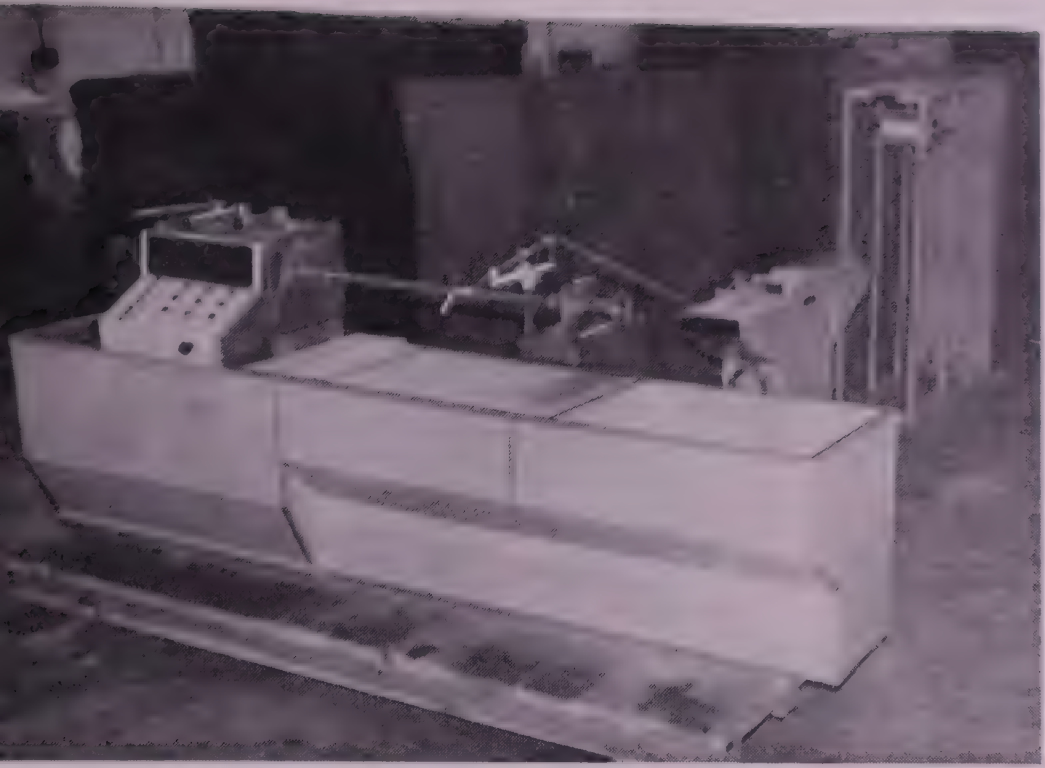
A number of processes for permanent press have been developed in USA, UK and Japan since 1963. These processes involve expensive capital equipment and sophisticated quality control and hence are not suitable for the Indian garment industry. Investigations at the Ahmedabad Textile Industry's Research Association (ATIRA) have led to the development of special catalysts which permit desired chemical modifications of cotton under much less severe conditions than required by the processes developed abroad.

The ATIRA process has the following distinctive features. (1) It does not require a baking oven or garment presses employing very high temperatures and pressures. The usual garment presses available with the Indian industry are normally quite adequate for the ATIRA process. In the case of very heavy suitings, a simple locally made and moderately priced Crease Setting Press developed by ATIRA can be used for obtaining sharp creases for trousers. (2) The conditions of garment curing are much less severe and thus avoid risk of damage to the goods and still produce Permanent Press satisfying internationally accepted standards and specifications. (3) Bulk of the quality control is carried out in the mill at the fabric finishing stage, simplifying the quality control procedures required at the garment stage.

The ATIRA process is of interest not only to small garment manufacturers but also to large manufacturers in advanced countries like USA because of easier, less troublesome and faster production methods for making permanent press garments possible with this process.

A rigorous quality control programme ensures that the mill, the garment manufacturer and ATIRA constantly check the fabrics and the garments at various stages of manufacture against internationally accepted standards of performance and stitching. In the mill, the treated fabric, popularly known as 'sensitized' fabric, is tested for its strength and performance properties, e.g. crease recovery, wash and wear rating, abrasion resistance, and strength. The garments are made from approved sensitized fabrics following special tailoring procedures in accordance with ATIRA's instructions regarding choice of sewing thread, lining material, stitches per inch, etc. The garment is pressed and simultaneously cured to set its shape permanently. After the garment is finished, it is checked by the garment factory for its wash-wear rating, crease rating, pucker-free seams, etc. A counter-check system has been established, requiring both the mill and the garment factory to send samples to ATIRA for conducting final tests before the garments go to the market. Only after satisfying these tests, the products get ATIRA seal of approval, which will be tagged on to each approved garment satisfying required specifications.

The ATIRA process is licensed exclusively till October 1971 to Sarangpur Cotton Mfg Co. Ltd, Ahmedabad and Bombay Dyeing & Mfg Co. Ltd, Bombay. Sarangpur Cotton Mfg Co. is manufacturing Permanent Press slacks, shirts, etc. through Hindustan Apparel Industries Ltd, Bombay under the trade name 'Bonds—Everprest' and Bombay Dyeing Co. has put up its products under the trade name 'Nevapress'. These products are already marketed throughout the big cities of India. With the cooperation of these two leading mills who joined



Filament winding machine developed at NAL, Bangalore

ATIRA during the commercial development stage, it has been possible to put the product in the market before any foreign process could enter the Indian market.

Filament Winding Machine

Fibreglass reinforced plastics (FRP) materials have wide applications in aerospace industry, chemical and electrical industries due to their high strength-to-weight ratio, chemical resistance and dielectric properties. Fibreglass filament wound structures are used in aerospace and missile structures, rocket motor casings, chemical tanks, electric battery cases and many other components for various industrial applications. The quality of the product depends on various process parameters like resin wetting, spacing of successive fibres, angle of winding, precuring, winding tension, etc. Any variation in these process parameters affects the strength of the product considerably.

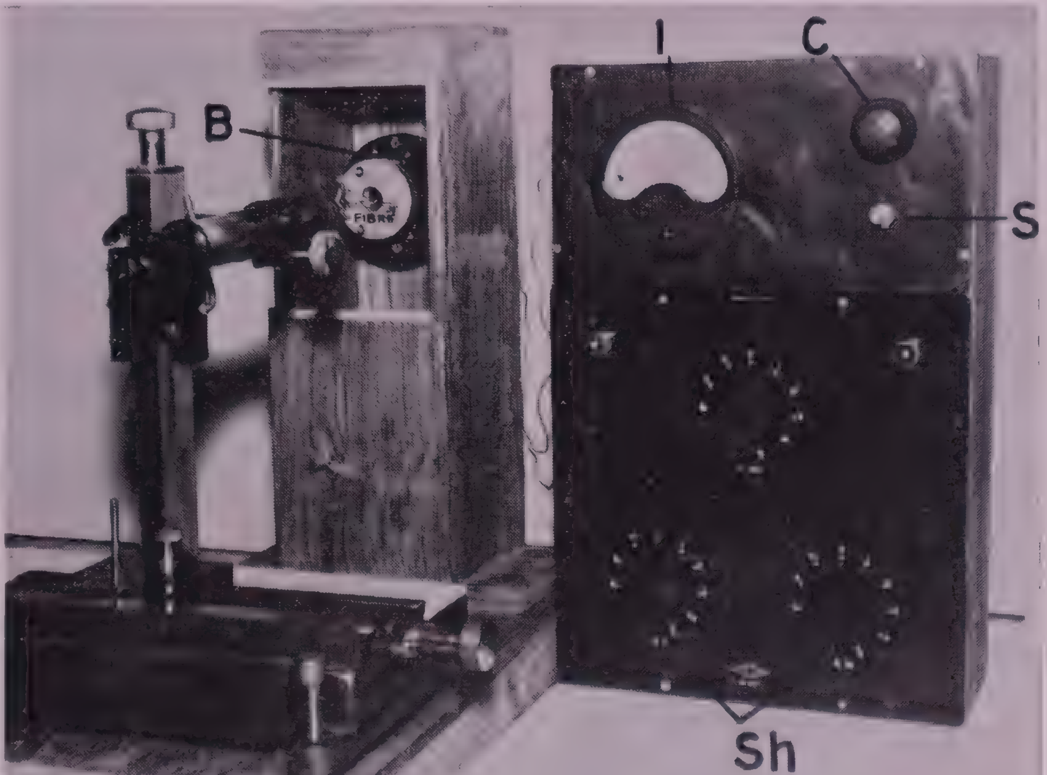
The National Aeronautical Laboratory (NAL), Bangalore has developed a filament winding machine for fabricating FRP cylinders and pressure vessels. The machine consists of a mandrel drive system, and a moving feeder which lays fibreglass filaments, wetted with binding materials like epoxy resins on to the rotating mandrel which winds the filament. By adjusting the speeds of the rotation of the mandrel and the movement of the feeder, the angle of winding can be controlled. The machine is provided with tension adjuster, a resin-wetting system, a precuring chamber, tension measuring device, etc. An electrical circuitry is provided for individually and simultaneously starting and stopping the mandrel drive system and the feeder drive system.

Fibreglass reinforced plastic nose cones were made by NAL for weather rockets launched by the Thumba Equatorial Rocket Launching Station, Thumba. Further work on developing more sophisticated machines, which can handle cylinders of larger size, is in progress.

Microbalance

An electrical microbalance for weighing primarily single fibres has been developed by the Central Leather Research Institute (CLRI), Madras using entirely indigenous parts. The principle used in the construction of the balance is the counter-balancing of the gravitational force by the force created by the magnetic field.

The balance consists of a milliammeter (I), a microammeter (B), variable resistances (S&C) and shunts (Sh). A 1.5-V dry cell is used as the source of electrical energy. The microammeter is mounted in a



Microbalance developed at CLRI, Madras

wooden box in such a position that the pointer is horizontal. A low power microscope tube is mounted on a heavy base to which the meter mounting box is rigidly fixed.

In operation, the microscope is focussed on the tip of the pointer of the meter B so that it coincides with the horizontal cross-wire. The material to be weighed is kept on the spade of the pointer or in an extremely light weight pan attached to the tip of the pointer. If fibres are to be weighed they may be suspended from the tip of the pointer by bending them into a V shape. The pointer moves down and control C is adjusted to bring back the pointer to its original position as seen through the microscope. The current indicated on the meter I is noted and the weight is read from a calibration line drawn with known weights and corresponding currents.

By adjusting the shunt, it is possible to use different weight ranges from tens of micrograms to a few milligrams. It is possible to weigh heavier materials by changing the two meters.

The microbalance will be of great use in the industry, industrial research and development organizations, research institutes and colleges. It is very useful in microchemical analysis.

Balances of the type fabricated by CLRI are not available commercially. The torsion balance, which is the nearest comparable balance, is a purely mechanical device and has to be imported. The advantages of the electrical microbalance are that its sensitivity is high (1 μg) and its capacity variable, whereas the torsion balance has low sensitivity (10 μg) and fixed capacity. Further, the construction of the electrical balance is simple, whereas the construction of the torsion balance requires special skill and entails the use of fine quartz torsion wires which are imported. The estimated cost of the electrical microbalance developed by CLRI is Rs 500 as against Rs 1300 for a torsion balance.

Studies on Rodenticides

An effective control of rats can be achieved by a three-pronged attack, namely, poison baiting, repellent spraying and burrow fumigation. This observation is based on studies carried out by Miss M. K. Krishnakumari of the Central Food Technological Research Institute, Mysore on the food preferences, density evaluation, rodenticidal activity of poisons, repellency of chemicals and efficiency of burrow fumigants under various ecological conditions. Using mainly black rat (*Rattus rattus*) as the experimental animal 16 sites ranging from simulated seminatural to natural conditions were designed and selected for studying the responses of rats to various treatments.

Since the successful use of rodenticides depends on the acceptability of the bait for the rat, bait formulation often is the critical element involved. Field tests indicated that rats prefer cereals to pulses and processed foods. Food in the form of granular, particulate, cube or blocks attracted more rats than the whole grain. A bait mix formulated from 74 parts of rice flour, 20 parts of wheat flour, 5 parts of groundnut cake flour, 1 part of salt and 8 parts of groundnut oil was found to have a high level of acceptance by rats under cage, cote and rattery conditions.

Of the various shapes of bait containers, the tubular ones, specially that of bamboo, attracted a greater number of rats than other shapes of bait containers. Kraft paper coated with quinine hydrochloride invariably attracted rats to the baiting point even in the presence of other food.

A new and rapid technique for recording imprint of rodents and other pests on smoked paper has been developed to facilitate identification of species on the basis of signs of foot, dentition and trailing of body parts and appendages. Recording of rodent signs and surplus-bait intake in conjunction with imprint technique gave clue to the degree of damage and density of rodent population in a given block, and enabled the assessment of the efficiency of a control technique in various study sites.

Barium carbonate at 10% level in the bait containing 9.2% protein and zinc phosphide at 3% level and norbormide at 1% level were very effective against rats. For burrow fumigation, a formulation consisting of the emulsifiable form of ethylene dibromide, carbon tetrachloride and ethylene dichloride and Lissapol has been found very useful. To beat off rats from food commodities, a formulation of malathion carried in high viscosity oils, such as groundnut oil, dutrex (mineral oil), proved effective when sprayed at 20 mg/cu ft.

Combined application of repellent spray on the existing source of food and poison baiting induced a higher degree of efficiency. The number of baiting points ordinarily required could be reduced if the repellent was sprayed on the bag stacks. This proved economical and effective in warehouses and food stores.

The data obtained from the studies show that the integrated application of the three techniques, namely, repellent spraying, poison baiting and disinfesting the burrows with fumigant emulsion is highly successful in the extermination of rats.

The researcher, Miss Krishnakumari of the institute, was awarded the Ph.D. degree by the University of Mysore (1969) for her thesis entitled, 'Studies on rodenticides and erodent repellents with special reference to the control of black rat (*Rattus rattus*)'.

Visitors

Prof. V. K. R. V. Rao, Union Minister of Education & Youth Services and Vice-President, CSIR visited the Central Electrochemical Research Institute (CECRI), Karaikudi on 1 Sept. 1969. Prof. Rao also laid the foundation-stone of the new library building of the institute.

Dr Lakshman Ponnamperuma, Director, Ceylon Institute of Scientific & Industrial Research, Colombo visited the National Physical Laboratory, New Delhi on 19 Sept. 1969.

Dr L. C. Knorr, Citrus Virologist, Citrus Experiment Station, University of Florida, Florida, USA who is on an assignment as Citrus Virology Adviser to the Punjab Agricultural University, Ludhiana visited the National Botanic Gardens, Lucknow from 19 to 21 Aug. 1969. Dr Knorr gave two illustrated lectures, one on the widespread disease of citrus, known as citrus decline, and the other on the world's citrus industry.

CSIR SUPPORT TO RESEARCH

New Schemes

Study of Electrical Double Layer

The electrical double layer formed at the interface between a charged metal and solution plays a significant part in electrochemical processes. An understanding of the nature of charge distribution at the interface is thus important. This problem forms the subject matter of a new CSIR scheme sanctioned to Dr K. M. Joshi, Professor of Chemistry, Institute of Science, Bombay.

It is proposed to investigate the double layer in the presence of two electrolytes in solution. In this three-component system the competitive adsorption of ions at the interface will be evaluated. The experimental technique is to use a capacitance bridge to determine the capacity of the electrode which is coupled to a large electrode. The capacity-potential variation gives double integration interfacial tension values which by application of Gibb's adsorption equation provide data relating to the charge and potential distribution at the electrode.

Kinetics of Electrophylic Substitution

A new CSIR scheme entitled 'Kinetics of electrophylic substitution reactions with metal chelates of oxine and methyl derivatives of oxine' has been taken up for investigation by Dr R. Prasad (principal investigator) in the Department of Chemistry, Patna University, Patna. The rate of halogenation of oxine differs from the rate of halogenation of metal chelates of oxine. A systematic study is therefore envisaged of the rates of halogenation in aqueous media of oxine and its metal chelates. The investigation will be carried out in four stages: (i) study of kinetics of electrophylic substitution in oxine and methyl derivatives of oxine, (ii) study of kinetics of electrophylic substitution in metal chelates of oxine and methyl derivatives of oxine, (iii) study of reaction mechanism of electrophylic substitution in ligand and metal-ligand complex, and (iv) preparation of some halogen derivatives of the ligand by using the metal chelate as the starting material and N-halogenosuccinamide as the halogenating agent.

The work is expected to lead to an understanding of the activation of the ligand to electrophylic substitution by coordination of a metal ion. A study of different electrophylic reactions on the chelate will be interesting if a consistent pattern of effect by each metal ion appears. The main objective of the work is to predict quantitatively the effect of coordination of metal ions on the reactivity of the ligand.

Schemes in Progress

Liver Function Tests in Severe Anaemias of Pregnancy

In a CSIR scheme being worked by Dr Veena N. Vora, Senior Research Fellow, at the Department of Obstetrics & Gynaecology, P. W. Medical College, Patna, a series of liver function tests have been carried out in 50 severely anaemic pregnant women having 50% of haemoglobin (7.4 g%, and less), to apparently normal pregnant women having 70% haemoglobin (10.4g % and more) and 10 severely anaemic nonpregnant women.

The salient features of the study have been certain findings of abrogated liver functions in cases of anaemias in pregnancy. The most significant of these is marked alteration in serum albumin, altered values of serum anaemias like SGOT and SGPT. Dye excretion studies using bromsulphathalein also showed higher values of dye retention in the plasma as compared to normal pregnancy. Values of such tests as thymol turbidity, alkaline phosphatase, serum bilirubin were found to be only very slightly different from normal.

Liver biopsies showed evidences of fatty changes, hydropic degeneration, haemorrhage and mild fibrin deposits in the portal tract.

The significance of hypoalbuminaemia in the body is great from the point of view of liver function as the liver is the site for albumin production and lowering of albumin to critical levels indicates inability of liver to cope with normal requirements for the maintenance of serum albumin level. The fall below a certain figure gravely affects the capacity of tissue building of the body, the power of wound healing, the capacity to deal with stresses and strains on toxaemia and infection. Hypoalbuminaemia produces a very vulnerable state for the body and also indicates a poorly functioning liver which would functionally fail much quicker under the assaults of hepatotoxins or hepatic infections, bacterial or viral.

It is quite possible that albumin production may not be much below 10-12 g/day, the normal value, but as a result of demands of the foetus and inability to cope with the added requirements, production rate starts going down and impairs the capacity of the liver cell substances.

The importance of high protein diet in preventing anaemias and curing it after it develops is being recognized. The incidence of anaemia in India is high and it is imperative that pregnancy be avoided in the anaemic state.

The other evidences of liver damage like high enzyme values, fatty changes, interlobular fibrosis, haemorrhages, etc. have shown that the liver cell has suffered under the stress of anaemic anoxia, and non-availability of essential substances like vitamin B_{12}, iron, folic acid, etc. with low availability of protein has shown damages much beyond those seen in ordinary anaemia. This is mostly due to the stress of the pregnant state and partly to added factors of toxaemia which may be present. The study has pointed to the conclusion that the liver cell in anaemic pregnant state suffers damages which give rise to special derangements of albumin synthesis. There is higher rate of leakage of SGOT and SGPT in serum suggesting increased permeability of the cell causing leakage of these enzymes due either to the large number of cells being in an altered state of cell membrane or possibly to anoxia. In addition, there may be the factor of increased number of cells undergoing death or degeneration. There is histological damage as well along with fibrosis in portal tracts which might or might not resolve, thus laying down the foundation of cirrhosis and other states of permanent liver damage.

CMRS Annual Report 1967-68

The Annual Report of the Central Mining Research Station (CMRS), Dhanbad describes the station's research activities under four main divisions with the number of research projects under each as follows: mine technology (17), mine safety (36), mine health (11), and mine engineering (15). The work of the station covers both coal and metalliferous mines.

Under mine technology, the investigations were on roof bolting, properties of rocks encountered, mine supports, subsidence, hydraulic sand stowing, pneumatic stowing and rock behaviour under tension, compression and shear and strata control. The mine safety team covered problems connected with explosions, fires, illumination, ventilation, air and dust analyses, spontaneous combustion and testing of safety equipment. The mine health division concerned itself with a study of incidence of miners' diseases, and tackled problems of industrial hygiene and physiology and air pollution. The mine engineering group took up studies on the efficacy of indigenous wire ropes, suspension gear arrangement, overcurrent protection, mining components, timber supports, steel props, indigenous winding ropes and mining-type cables in the field.

The station investigated the effectiveness of roof bolting as a means of roof support in place of the conventional timber support. The investigation revealed that roof bolts could replace the conventional supports and that roof bolts are safer and more economical. The station completed the erection of 91.4 m long 1.2 m dia. steel surface coal dust explosion gallery and carried out test coal dust explosion in the gallery. Work on the standardization of hydrogen sulphide detector tubes developed by CMRS was completed. The know-how developed by the laboratory for the manufacture of carbon monoxide detector tubes was released for commercial utilization.

The station continued to provide technical services to the mining industry, such as testing of physical properties of rocks, analysis of mine gas, mine water, mine dust and stone dust, and testing, calibration and certification of instruments and equipment used in open and underground mines.

Four research papers were published and three patents were filed. The invention relating to the development of remote indicating hydraulic load cell and remote indicating convergence indicator was awarded by the Inventions Promotion Board.

Chemicals and Oil from Coal

The symposium, which was earlier postponed from its original schedule, will be held during 6-8 Dec. 1969 at the Central Fuel Research Institute, Dhanbad. Prof. V. K. R. V. Rao, Union Minister of Education & Youth Services will be inaugurating the symposium.

PATENTS

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120706: Improved thin film thickness monitor with superior pulse shaper, S. P. Suri & V. V. Shah, NPL, New Delhi.

120868: A process for the recovery of microbial cells from petroleum hydrocarbon fermentation broth, S. P. Srivastava, J. N. Baruah, H. D. Singh, P. V. Krishna & M. S. Iyengar—RRL, Jorhat.

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120955: A new process for the separation of microbial cells from hydrocarbon fermentation broth, H. D. Singh, J. N. Baruah, K. Vadalkar & M. S. Iyengar— RRL, Jorhat.

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121100: Improvements in or relating to the electrolytic preparation of potassium chlorate from potassium chloride, H. V. Udupa, S. Sampath, N. S. Ramachandran, V. Dhuruvan, K. C. Narasimham, M. Nagalingam, N. S. Thiagarajan, G. G. Subramanian, P. Subbiah, R. G. Palanisamy, S. J. Peter & S. Pushpavanam—CECRI, Karaikudi.

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121538: A process for the shellac-polyester-urethane compositions for use in textiles water-proofing, adhesives, paints and varnishes, and in electrical insulating varnishes, N. D. Ghatge & S. R. Srinivasan—NCL, Poona.

121696: A process for the production of surface active agents of the type of amide of fatty acid monoglyceride sulphonate, R. N. Mukherjea & A. Gupta—Jadavpur University, Calcutta.

ACCEPTED

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112675: An inter-communication system, R. Parshad—NPL, New Delhi.

112861: A process for grease-proofing paper by means of surface treatment, B. P. Chaliha, S. B. Lodh & M. S. Iyengar—RRL, Jorhat.

113036: A process of making dissolving grade pulp from bamboo, D. Mahanta, B. P. Chaliha, S. B. Lodh & M. S. Iyengar—RRL, Jorhat.

113127: Improvements in or relating to microphones, P. Chenchanna—CMERI, Durgapur.

113473: Improvements in or relating to copper electroplating on stainless steels, R. Subramanian, S. Chakrapani, R. Venkatachalam & B. A. Shenoi—CECRI, Karaikudi.

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113779: A new material for manufacture of roofing sheets, building boards, pipes and sanitary fittings, K. L. Arora, Y. C. Gokhale, B. P. Chaliha, S. B. Lodh & M. S. Iyengar—RRL, Jorhat.

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CSIR NEWS

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Testing Facilities & Technical Services

Test & Evaluation Centre for Electronic and Electrical Equipment at NPL

Electronic equipment are more prone to breakdown and erratic behaviour in the tropics than any other electrical equipment. This is because high insulation resistance is essential for the proper functioning of electronic equipment. All components, terminal strips, tag strips and wires have to be well protected against the ingress or deposition of moisture if they have to function satisfactorily, since surface moisture combined with high ambient temperature not only aids the growth of fungus but reduces the insulation resistance. All components have to be suitably treated to prevent the wetting of the surface by condensed moisture. Condensation is quite heavy in the tropics due to high humidity and large variation in day-night temperatures. The tests to assess the efficacy of tropic proofing have to take into consideration all these factors, and have to be devised in such a way that they show up incipient faults in the equipment.

In addition to the ingress of moisture under high humidity, equipment are apt to be subjected to mechanical shocks and vibrations, corrosion, etc. as a result of duty regulations. The combined effect of all these factors on the components can be evaluated only when they are subjected to about 20 different tests in a proper sequence.

Tests

The tests which come under basic climatic and mechanical durability are as follows:

Cold test, dry heat test, damp heat accelerated test, damp heat long term exposure, bump and shock test, vibration test, constant acceleration test, storage test, mould growth test, salt mist test, dust test, low air pressure test, high air pressure test, rapid change of temperature test, hermetic sealing test, tests for soldering and exposure to sunlight and robustness of terminations. A standard sequence followed for evaluating the effect of interdependent conditions is: dry heat test; damp heat accelerated first cycle test; cold test; low air pressure test; and damp heat accelerated (remaining cycles) test.

The description of the tests and of the main equipment required to conduct the tests is given in IS: 589-1961.

The Bhabha Committee on Electronics in its report on the directions in which the electronics industry should progress if it is to play its vital role in all fields of activity had recommended the setting up of Test & Evaluation Centres on zonal basis. Delhi was chosen for the northern zone and the National Physical Laboratory (NPL), New Delhi was assigned this task.

In 1950-51, NPL had set up an environmental testing laboratory to test and study the behaviour of electronic components under simulated conditions.

The objectives of the environmental testing laboratory were:

(1) To study the materials and evolve processes for manufacture of electronic components using indigenous materials, particularly as regards their performance under tropical climatic conditions. This study enabled the Radio Components Development Unit of NPL to choose proper materials and lay down process for tropicalization.

(2) To collect experimental data required for the formulation of Indian Standards for electronic components and equipment. NPL has been playing a very active role ever since inception in the various committees of the Electrotechnical Division of the Indian Standards Institution.

The results of the investigations conducted in the environmental laboratory, particularly in the field of climatic and durability testing, were useful not only for the formulation of Indian Standards but were also of value in guiding the International Electrotechnical Commission (IEC) standards. Many of the clauses for tropical testing in the international specifications were found to be inadequate and not representative of the actual field conditions in the tropics.

Contributions to IEC

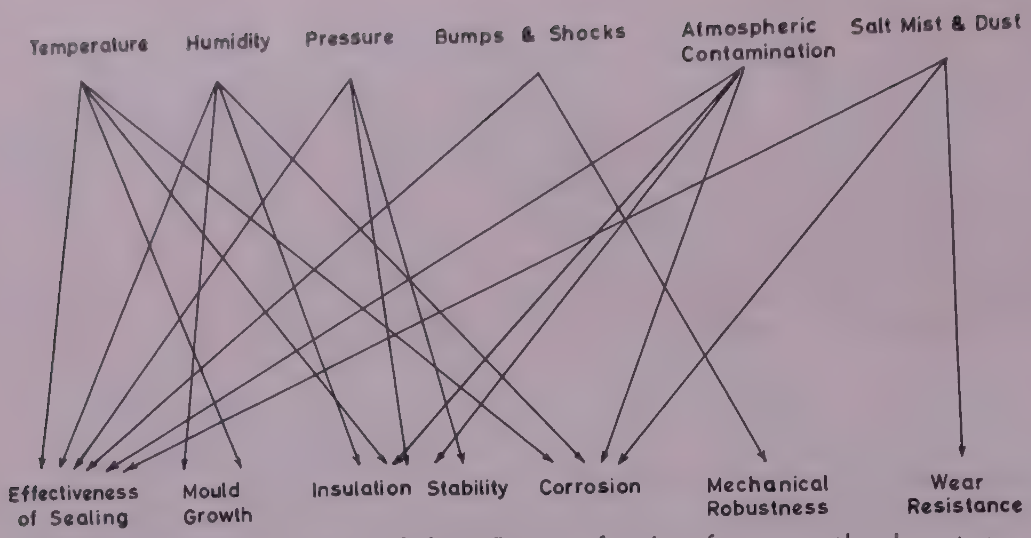
Though the facilities available in the Environmental Testing Laboratory were meagre, it made some significant contributions both nationally and internationally on environmental testing under tropical conditions. Some of the important contributions are given in the following paragraphs.

Industrial Atmosphere

At the instance of a Parliamentary Committee the laboratory undertook a study of the deterioration of telephone cables and its prevention. During the course of the studies it was found that industrial atmosphere in coastal cities contains significant amounts of hydrogen sulphide in addition to other gases, which causes corrosion. The data were communicated to the International Electrotechnical Commission which introduced a new clause in its specifications.

Clayey Dust

IEC in its specifications for climatic and durability testing had stipulated that the dust test should primarily take into consideration



Diagrammatic representation of the influence of various factors on the characteristics of electronic/electrical components

sand, silica and quartz particles, which abrade component parts. This test simulates the dry desert conditions but not humid wet conditions such as are in many parts of India where there is a clayey form of dust which has a tendency to stick on to insulating surfaces, thereby forming a leakage path. This recommendation has also been accepted and the specification now includes not only abrasive dust test but dust consisting of clayey matter.

Comfort Current

The IEC committee on Safety had stipulated 0.7 mA peak as the maximum permissible leakage current for considering a part as 'live'. This value was found to be unacceptable for tropical conditions, in which people move about with bare feet on bare floors. During the monsoon the floors are often moist and moistening of hands and feet is quite common. Perspiration and consequent salinity reduce contact resistance considerably.

To determine what is likely to be the comfortable current for handling electrical and electronic equipment without experiencing an unpleasant sensation of shock an apparatus was designed. This was installed in such places as Bombay, Calcutta, Delhi, Madras, Bangalore and Pilani. About 1200 reactions were obtained and statistically analysed. The analysis showed that the permissible current cannot exceed 0.3 mA peak. The data which were presented to IEC at its meeting in New Delhi in 1960 were adopted for incorporation in the document as Comfort Current. This concept has now been extended by IEC to domestic electrical appliances also. This study is much more pertinent to electrical appliances, specially those used in kitchens in tropics.

Testing for Other Countries

Many countries have shown interest from time to time in setting up a coordinated programme of research on the environmental studies under tropical conditions in India. These countries were not interested in laboratory studies for which they have intensive facilities, but in the behavioural pattern of electronic equipment and materials under field conditions in tropics and their correlation with laboratory simulated conditions. Some of the countries and organizations which have evinced interest are USSR, Bulgaria, Hungary, Poland, Rumania, and the British Instrument Manufacturers Association. Recently, Czechoslovakia has shown keen interest and has offered to set up a laboratory in India.

A committee was constituted by CSIR to study the Czechoslovakian proposal and it has recommended that:

(1) A collaborative programme is not feasible at this stage.

(2) The type of work that Czechoslovakia envisages may be carried out by the existing institutes. The augmentation of facilities that will be required for meeting the requirements of the Czechoslovakian Government can be assessed after discussions at a technical level with its representatives. The committee reiterated the recommendations that have been made earlier that the existing facilities must be augmented to the extent required.

The terms of reference of the committee are quite comprehensive and go beyond the immediate problem of the offer from the Czechoslovakian Government for coordinated research.

Terms of Reference

(1) To critically assess present facilities available in various laboratories/organizations/institutions for carrying out environmental tests under laboratory conditions.

(2) To draw up a plan for exposure/field stations in various parts of the country so that the stations will cover all types of tropical climate prevailing in the country.

(3) To draw up minimal requirements of facilities for each station.

(4) To recommend additional facilities by way of equipment, staff, space, etc. for these organizations that have a nucleus of test facilities already.

(5) To study the fields that have to be covered to bring up the present test facilities to cater to the essential requirements of international standards.

(6) To recommend the setting up of additional facilities, if need be, in organizations / laboratories / institutions other than those that already have such facilities in order to cover the entire field of environmental testing (tropical testing) of all equipment, components and materials.

(7) To collect data obtained from different test centres and correlate them.

(8) To act as coordinating authority in regard to allocation of tests to be conducted for various organizations when requests are received from foreign countries for such service.

From a study of the problems involved in tropical exposure the major lacuna in the effort of various organizations in India which are interested in tropicalization appears to be in the systematic study of field exposure and correlation. This aspect has not received much importance, particularly in the civilian establishments.

Low-high temperature chamber test

Long-term humidity chamber test

The National Physical Laboratory can extend its existing facilities by providing exposure stations in different parts of the country chosen for their varied climatic conditions. These stations need only be open sheds of a simple structure provided with electrical connections and fitted with suitable safety devices to operate equipment continuously or cyclically. It is not necessary to have a very elaborate building structure as the primary purpose is to expose the equipment and instruments to the prevalent severe climatic conditions of humidity, temperature, dust, industrial gases, etc. The sites have to be chosen to cover all the above conditions; for example, consideration may be given to places like Calcutta, Bombay, Jorhat, Bangalore, Gulmarg, Pilani. The places have been chosen as a civilian laboratory/institution is located in that area.

The laboratories/institutions will have to organize their facilities to cover the following aspects:

(1) Exposure tests of materials/components used in the construction of electrical and electronic equipments, instruments, etc., with a view to obtaining data needed for research and development of new accelerated laboratory tests which will effectively simulate tropical climate correlated with operation effects.

(2) To collect data for correlation between the accelerated laboratory tests and field conditions.

(3) To establish the mechanism of deterioration of new materials and components that may be available from time to time.

(4) To establish the effects of tropical climate with regard to new technology and design.

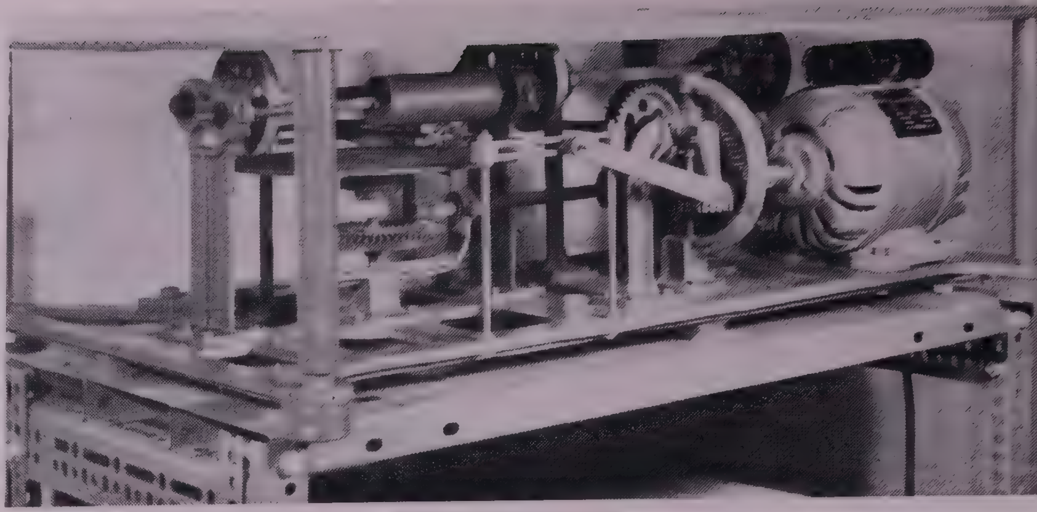
(5) To establish the mechanism of deterioration of electrical and electronic functional engineering elements in the tropics.

(6) To do research on the life of electrical and electronic equipment/instruments in tropical atmosphere.

(7) To gather information on failures of electrical/electronic equipment, instruments and components for analysis.

These aspects also cover broadly the programme suggested by Czechoslovakia. India has been receiving proposals from time to time from various countries for carrying out research in tropicalization. These stress primarily on the study of the effects of exposure to tropical

Bump testing machine fabricated at NPL



Low frequency vibration testing machine fabricated at NPL

climate of electrical and electronic equipment, instruments and materials used in their construction.

In order that the Test & Evaluation Centre can cope with the work that has to be undertaken to play a part nationally and internationally, the Centre will be equipped with some of the most modern types of test equipment valued at about Rs 45 lakhs. The project has been drawn up to cover all aspects of reliability studies on components and equipment. The first phase of the programme has been approved and the Electronics Committee has provided funds totalling Rs 19 lakhs for capital equipment. Orders have been placed and some of the equipment have been received. The illustrations give an idea of the equipment in the environmental testing laboratory, some of which have been fabricated in the laboratory.

The primary functions of the Test & Evaluation Centre in the first phase of the programme are as follows:

(1) To carry out tests according to the relevant standards on components both for civilian and military requirements.

(2) To gather data as regards the correlation of the laboratory tests and their operation in actual field conditions in collaboration with the other two centres, and thereby assess whether the present tests require modifications or not; to evaluate the actual life of the components under tropical conditions and the corresponding cycles of climatic and durability tests to which they are subjected.

(3) To study and test the various materials that are used in the manufacture of components and advise the entrepreneurs as to the quality of the materials that have to be used for making components which will come up to the standards.

(4) To ensure that the results of the test and evaluation are made available to the entrepreneurs with the minimum amount of procedural delays in order that small scale entrepreneurs will not be put to unnecessary inconvenience and financial loss.

In addition to these functions, which are primarily oriented to the country's needs, a programme of research for other countries is also envisaged. It is proposed to establish close collaboration with the other zonal centres and the Indian Standards Institution in correlating field data.

High altitude chamber test

Seminar on Development and Testing of High Temperature Materials

In collaboration with the National Metallurgical Laboratory (NML), Jamshedpur the Research and Development Organization for the Electrical Industry, Bhopal organized a seminar on 'Development and Testing of High Temperature Materials' at NML, Jamshedpur from 10 to 12 Sept. 1969.

Inaugurating the seminar, Dr V. A. Altekar, Director, NML stressed the need for the development of high temperature creep resistant steels and alloys for the manufacture of sophisticated high temperature machineries like high pressure boilers, pressure vessels, steam and gas turbines. With the progress made by the basic heavy industries, the production of indigenous alloys suitable for the above purposes had become imperative. A great lacuna, however, exists for evaluating the elevated temperature properties of these alloys which are to conform to rigid specifications without which these alloys will not be acceptable to the designers and consequently the entire demand of creep resisting steels and alloys will have to be met by import. In this context Dr Altekar said that the deliberations of the seminar can be useful to evaluate the proposal of NML to set up a Creep Testing Laboratory and to draw targets and priorities for the development and testing of creep resisting alloys.

The laboratory, Dr Altekar pointed out, is alive to the needs of the industry and has made a quick survey relating to development, production, design and use of high temperature alloys in the country vis-a-vis the creep testing facilities available in the country. As facilities for creep testing have been found totally inadequate, NML is expanding its existing creep testing laboratory to meet the demand of industry.

Dr Altekar hoped that there would be equal participation of reearch and industry in the establishment of the creep laboratory at NML and invited the industries to ake their share of the capital investments, as it is for their benefit that NML has come forward with the proposal to have a Central Creep Testing section. Capital investment for such a set-up is very insignificant ompared to the total outlay of the major industries engaged in the production of high temperature alloys and for manufacture of boilers and urbines.

The discussions were held in three echnical sessions: (i) high temperature alloys, (ii) testing requirements and facilities, and (iii) collaboration arrangements. The concluding session on projected programme of work brought out the need for nationalizing the steels being used by the various units of the Heavy Electrical Industries, so that the number of steels for a given component can be reduced to a minimum to ease development of the corresponding grades of alloys in India. However, for high temperature bolting applications three grades of steels were selected on specific recommendations. For standardizing other grades of steels a subcommittee consisting of members from the various units of the Heavy Electrical Manufacturing Plants was asked to go into detailed specifications of common grades of steels.

The representatives of Steel Plants indicated that it would not be difficult for them to produce the high temperature steels. The main bottleneck was the limited creep testing facilities available in the country. The committee recommended that the creep testing facilities at NML must be fully developed to cater to the entire demands of the Heavy Electrical units. Keeping in view the present and future load of creep and stress relaxation testing on materials from Hyderabad, and Tiruchirapalli and Bhopal units of the Heavy Electrical Industries and from the Steel Plants, Alloy Steel Plant and Mahindra Ugine Steel Co. Ltd, it was agreed that the 150 test points would be the bare minimum requirement in the initial stages.

A planning group under the chairmanship of Dr Altekar was set up to examine in detail the creep testing facilities to be established initially and in subsequent stages, to suggest ways for financial and technical participation of the various organizations and to explore the possibility of using indigenous creep testing machines.

The planning group had detailed discussions on the quantum of work involved and requirements of creep testing facilities, and recommended that the creep testing facilities at NML must be expanded to 150 test points initially with about 28 high sensitivity single point, 10 medium sensitivity single point and the remaining multispecimen creep testing machines. It was assessed that inclusive of the 150 test points immediately required to be set up and the ambient temperature and humidity control and building, a capital investment of the order of Rs 45 lakhs and a recurring annual expenditure of about Rs 2.5 lakhs would be required. To meet the recurring cost, a nominal charge may be levied on each sample tested for creep hour. It was agreed that this investment should be shared by the participating industries, viz. the heavy electrical industries and alloy steel manufacturers. The quantum and mode of participation should be decided by discussion with the managements of the various organizations. A board may regulate the working of these facilities, maintenance, programme, priority, etc. It was further agreed that initially all these creep testing machines will have to be imported, but simultaneously the creep testing machine developed by the Central Mechanical Engineering Research Institute, Durgapur should be further standardized in collaboration with the National Aeronautical Laboratory, Bangalore which will incorporate control and sensing devices in the machine. It was also suggested that multispecimen creep testing machines should be developed in India as these machines are simpler and can be readily adopted for use.

Handbook for Prestressed Concrete Bridges

Selection of prestressed concrete section involves a lengthy process of trial and error. Designers do not often have time to examine the relative merits of arrangements involving different number of bridge girders; nor is it practicable for them to compare alternative schemes involving different types of girders for a given situation because of the prohibitive amount of calculation involved. With the availability of electronic digital computers the tedious process of calculation can be avoided. Sections may be tabulated once for all. With this object in view the Structural Engineering Research Centre (SERC), Roorkee has compiled the handbook (compilers: S. Sarkar, A. S. Prasada Rao, M. S. Kapla and J. N. Chhauda).

Making use of the computer programmes developed at SERC, prestressed bridge girders have been standardized and tabulated in the span range, 7.5-36 m. The types of sections for which details have been tabulated are: (1) composite inverted T-beams surrounded by *in situ* concrete in the span range, 7.5-16.5 m; (2) post-tensioned hollow-box girders of 12-36 m; (3) composite I-sections of 12-36 m span; and (4) precast post-tensioned T-sections in the span range, 12-36 m.

The standardization attempted is patterned on the work of AASHO-PCI in USA and the Prestressed Concrete Development Group in UK. Sections tabulated conform to the Indian Roads Congress loadings. The units chosen are in M.K.S. system.

The handbook contains 18 design charts and 119 tables giving the details of various types of sections for different spans. The tabular matter gives dimensions of section, the prestressing force and eccentricity at critical section.

Included in the handbook is a chapter on cost analysis of the different types of decks, which also provides guidelines on the suitability of various types of decks under different conditions. For spans less than 12 m, composite inverted T-decks are found to be economical. These decks are suitable where head room is restricted and the time available for construction is limited. For simply supported decks, box girders may not be economical. If lifting is no problem, these can be used where speedy construction is needed. Composite I-girders are found to be most economical for medium span bridges. If deck economy is the only consideration then 3-girder decks should be used. If construction depth and launching pose problems, decks with 9 girders should be preferred. As a compromise 6-girder decks may offer reasonably low cost and tolerable deck depths. It is often advantageous to use high precast strengths as they offer low construction depths and less weight without unduly affecting economy. If launching is not a problem, T-girder decks are most suitable. These involve less *in situ* work and result in less construction depth.

Compiled at the instance of engineers and organizations engaged in the design of bridges, the handbook (demy 4to, 240 pages) should be of particular value to structural design engineers.

Sasmira Annual Report 1968-69

The annual report of the Silk & Art Silk Mills' Research Association (Sasmira), Bombay, which has been published recently, shows that the association investigated 12 research projects one of which was completed during the year. The association developed a dual shade water repellent nylon fabric meeting the requirements of the Defence. In collaboration with the National Chemical Laboratory, Poona the association developed a polyurethane formulation for imparting water-repellent or water-proof finish to nylon fabrics. Five economic and market surveys were completed. One of the surveys related to denier-wise and variety-wise consumption of man-made fibres in India during the last six years. This survey was undertaken at the instance of the Development Council for Man-made Textiles to enable the Council to advise the Planning Commission for determining the targets of production of man-made fibres during the fourth Five Year Plan period. The association's sample survey of the production of fabrics on warp knitting machines has revealed that one warp knitting machine is equivalent to 20 power looms and under ideal conditions the production on warp knitting machines may go higher than 400 linear metres.

The Sasmira laboratories investigated 177 technological problems referred to by the member units and industry in regard to fabric defects, sizing, dyeing, printing, finishing, SQC and productivity. Also, 4630 samples of man-made fibre fabrics meant for export were tested. The association fabricated instruments like perspirometer and crimp tester for quality control.

Hot Water Treatment for Ripening of Mangoes

Ripening of mangoes without spoilage for processing is a big problem faced by the fruit processing industry in the country. During the season that lasts two to three months, a large quantity of mangoes is required to be ripened for processing. The conventional method of ripening mangoes which is currently practised by the processors, by keeping them in hay for a number of days, generally results in heavy spoilage of these fruits due to fungus infection; sometimes the spoilage is as high as 30-40 per cent.

A method for uniform ripening of mangoes with minimum of spoilage has been standardized by the Central Food Technological Research Institute (CFTRI), Mysore. It consists in dipping mango fruits (*badami*) of 75 to 90 per cent maturity in hot water for a specified period, maintaining the temperature of water at an appropriate level. The fruits are then taken out of hot water and packed in wooden crates, where ripening will generally start from the seventh day and is completed between the 12th and the 14th day.

The cost of hot water treatment in processing factories would be practically negligible. A uniform ripening of the fruits was achieved during trials. Also, the processed products from treated mangoes were found to be superior to those from untreated fruits in colour, flavour and texture.

Antifungal Paste for Bananas

An antifungal paste to prevent fungus infection on the cut surfaces of banana hands and bunches during transportation and storage has been developed by the Central Food Technological Research Institute (CFTRI), Mysore using indigenous raw materials.

Banana bunches are cut into hands and then packed in cartons for export. When the surfaces are not protected, the hands are likely to decay due to fungus infection. Application of this antifungal paste on the cut surfaces of banana hands will prevent fungus growth for a period of 18-21 days at low temperature storage. This paste is to be applied to the cut ends of bananas with the help of a brush.

Trials carried out so far have shown that the paste is as good as imported products. A recent shipment of bananas, treated with this paste, to one of the West Asian countries is reported to have reached that country without decay. According to the exporter, the paste was found much superior to the imported product, and the bananas were free from fungus growth at low temperature for a period of 20 days after cutting.

The development of this paste assumes significance in view of the country's efforts to export large quantities of bananas in the next few years. For treating every 1000 tonnes of bananas exported, about one tonne of paste is required. Antifungal paste for bananas is at present imported and it costs over Rs 10 per kg in foreign exchange, exclusive of freight charges.

The cost of application of the antifungal paste developed by CFTRI works out to less than 2 paise per hand. Extensive commercial trials are being carried out to confirm the results. Efforts are also being made to modify the formulation to make it conform to the stringent health standards prescribed by the importing countries.

Training and Refresher Courses at CPHERI

A two-day training course in plastic plumbing was conducted by the Central Public Health Engineering Research Institute Zonal Centre, Bombay during 6-7 Sept. 1969 in collaboration with the National Buildings Organization, New Delhi and the Indian Water Works Association, Bombay.

A refresher course on all India level for officers looking after problems relating to utilization of organic manures was organized by the Directorate of Extension, Union Ministry of Food, Agriculture, Community Development and Cooperation at the Central Public Health Engineering Research Institute, Nagpur during 9-11 Sept. 1969.

PROCESSES READY FOR COMMERCIAL UTILIZATION

Iodized Common Salt

Iodine deficiency causes goitre ndemic. In goitre affected sub-Himaayan region ranging from Jammu & Kashmir to Assam, nearly 2.75 akh tonnes of iodized salt are reuired to root out the deficiency isease.

The existing method for the manufacture of iodized salt consists n either dry mixing or wet spraying f potassium iodate in the ratio :40000 parts with common salt. Dry mixing of potassium iodide with stabilizer such as precipitated chalk n the ratio 1:10 is also resorted to or manufacturing the salt. By this method common salt of iodine conent 14.84 ppm is obtained. Iodized alt is presently manufactured at ambhar lake, Kharaghoda and Calutta by using the equipment supplied y the World Health Organization.

The Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar has developed a new rocess for the manufacture of iodized salt using calcium iodate intead of potassium iodate. Calcium odate has been found to be more table than potassium iodate. Calium iodate is prepared by the rection of potassium iodate with alcium chloride.

The process consists in adding alcium iodate (40 ppm) to saturated brine at 25.6° Be' in impercolative rystallizer pans. Natural evaporaion is permitted with occasional aking of salt crop in the initial tage. When the salt crop is ready, t is extracted in the conventional way and iodized salt is heaped preferably in the shade or formed to a arge size heap. The iodized salt contains iodine partially impregnated nto the body of the salt crystals. The bittern containing unutilized odine is recirculated to the pan and on making up the deficiency of iodine in the crystallizer pan, the process is repeated. If recirculation s not desired, the bittern is stored in pan and saturated brine is added to bring the concentration to about 26° Be'. The iodine concentration s brought to 150 ppm. Salt from he stores or directly extracted from he pan is submerged for 10-15 min which provides iodized salt at a level of about 15 ppm iodine.

In this process no mechanical appliance is needed and iodized salt could be manufactured in salt works of any size or even at the place of consumption to avoid the high rate of depreciation of iodine during storage and transportation.

The process has been studied under laboratory conditions and in cement-lined experimental pans (size, 8×2 m).

Iodine is the chief raw material, which has to be imported; but its requirement is small. Seawater forms the source of salt manufacture.

The equipment required for the manufacture of iodized salt are pans and small sized reacting vessels.

Exaltolide

A process for the production of exaltolide from mustard oil, which is available abundantly in the country, has been developed by the National Chemical Laboratory (NCL), Poona. Exaltolide has a musk-like odour and is used in costly perfumery preparations.

The process has been worked out on laboratory scale (250 g/batch). Nonoic aldehyde which is a byproduct in the preparation of exaltolide is also a valuable perfumery chemical.

The process consists of the following steps: (1) preparation of erucyl alcohol from ethyl erucate obtained from mustard seed oil, (2) hydroxylation of erucyl alcohol, (3) oxidation of 13,14-dihydroxybehenyl alcohol, (4) condensation of 13-hydroxytridecanol and hydrogenation of 15-hydroxypentadec-2-enoic acid, and (5) cyclization of 15-hydroxypentadecenoic acid to exaltolide.

The raw materials required in the process are: magnesium oxide, alumina (grade II), petroleum ether, malonic acid, pyridine, nickel catalyst, alcohol, ether, sodium metaperiodate, sodium sulphate (anhydrous), hydrochloric acid, sodium hydroxide, sodium bisulphide, sulphuric acid, hydrogen peroxide, acetic acid, calcium metal, toluene, isopropyl alcohol, sodium, mustard oil and glass wool.

There is good scope for exporting exaltolide. The product prepared by the NCL process has been sold at the rate of Rs 5000/kg. Only an established firm in the field of perfumery chemicals can undertake the production of exaltolide. The glass equipment available in plants producing perfumery chemicals is sufficient for the production of the chemical.

Parties interested in the commercial development of the above processes are requested to correspond with the Secretary, National Research Development Corporation of India, Mandi House, Lytton Road, New Delhi 1.

DEPUTATIONS

Dr N. Krishnaswamy, Scientist, Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar attended the international conference on 'Ion exchange in the process industries' held at the Imperial College of Science & Technology, London under the auspices of the Society of Chemical Industry, UK during 16-18 July 1969. Dr Krishnaswamy presented a paper entitled, 'Properties of hydrous oxide inorganic exchanges' by K. R. Pai, N. Krishnaswamy and D. S. Datar at the session on Inorganic Exchanges.

The authors have prepared hydrous oxides of thorium, zirconium, and aluminium using sodium hydrooxide and ammonia in different metal-to-alkali ratios. The anion- and cation-exchange capacities have been determined by measuring the chloride displaced from the exchanger by nitrate ion and by calcium uptake respectively. With increasing metal-to-alkali ratio and ammonium hydroxide used for precipitation, hydrous thorium oxide showed decreasing anion-exchange capacity and increasing cation-exchange capacity, and anhydrous zirconium oxide showed increasing cation-exchange capacity. When sodium hydroxide was used for precipitation, both cation and anion-exchange capacities of hydrous thorium oxide remained independent of the amount of alkali, whereas the cation-exchange capacity of hydrous zirconium oxide increased with the amount of alkali added.

The hydrous oxides of thorium and zirconium precipitated with sodium hydroxide had greater porosity and showed faster rates of exchange than those precipitated with ammonium hydroxide.

The pH titration curves for thorium and zirconium hydrous oxides indicated the presence of only one active group.

After partaking in the conference, Dr Krishnaswamy visited various laboratories and firms engaged in investigations on ion-exchange materials.

Dr T. Radhakrishnan

Dr T. Radhakrishnan took over as Director, Indian Jute Industries' Research Association, Calcutta on 1 Sept. 1969.

Born in 1925 in Kerala, Dr Radhakrishnan had his school and collegiate education at Cochin and at the Presidency College, Madras where he obtained a post-graduate degree in physics. Dr Radhakrishnan joined the Indian Institute of Science, Bangalore in 1946 as a student of Professor C. V. Raman. He obtained his Ph.D. degree in crystal optics from the Institute in 1951 and joined the Ahmedabad Textile Industry's Research Association (ATIRA), Ahmedabad as a Senior Scientific Officer. Shortly thereafter, he studied textile physics and instrumentation at the Massachusetts Institute of Technology and other laboratories—partly on deputation from ATIRA and partly under the Point Four programme of USA. Returning to ATIRA, Dr Radhakrishnan specialized in fibre physics, textile testing and instrumentation and rose to the position of Deputy Director and Head of the Physics Divsion of ATIRA. In March 1969 he joined the Indian Jute Industries' Research Association as Director-designate. Dr Radhakrishnan has published about 80 papers mostly on fibre fine structure, mechanics of textiles and methods of testing.

He is a recognized post-graduate guide in physics of the Gujarat and Bombay universities. He has invented and patented a number of instruments and one of these instruments has secured a prize from the Inventions Promotion Board. Dr Radhakrishnan is a Fellow of the Indian Academy of Sciences.

Fourth Symposium on Earthquake Engineering

The fourth symposium on Earthquake Engineering will be held at the University of Roorkee, Roorkee during 14-16 Nov. 1970.

The symposium will cover the following aspects of earthquake engineering: structural response and design of structures for earthquake and blast forces; design of dams and appurtenent works in earthquake zones; housing in seismic zones and damage during earthquakes; soil and foundation behaviour during earthquakes; instruments for earthquake engineering and seismological studies; seismicity, wave propagation and ground motion; seismo-tectonic studies of seismic regions; and observation of earthquake damage and determination of iso-seismal and iso-force lines.

Those desirous of contributing papers may first send the synopsis, not exceeding 300 words, to the School of Research and Training in Earthquake Engineering, University of Roorkee, Roorkee (UP) by 31 March 1970; full papers (not exceeding 6000 words) should reach by 30 June 1970.

PATENTS

FILED

121760: Improvements in or relating to the process for the synthesis of isoamyl ethyl silicates and cetyl ethyl silicates, R. S. Bhute, M.A. Sivasamban—RRL, Hyderabad.

121776: An unevenness indicator for indicating pavement irregularities, M. P. Dhir, A. K. Bhat, S. S. Rup, B. D. Ved & J. Mitter, CRRI, New Delhi.

121777: A marking or/and indicating device suitable for attachment to an unevenness measuring machine, M. P. Dhir, A. K. Bhat, S. S. Rup, B. D. Ved & J. Mitter—CRRI, New Delhi.

120224: Improved pulse dehusking machine, P. P. Kurien & A. R. Ramesh—CFTRI, Mysore.

122025: New support material for gas chromatography from attapulgite, K.L. Malik & R. Moolchandra —IIP, Dehra Dun.

122114: A profilograph for checking pavement unevenness, A. K. Bhat, S. S. Rup & G. L. Chandel—CRRI, New Delhi.

122217: Improvements in or relating to soft ferrites for use in medium and short wave frequencies, C. V. Ganapathy, G. Govindaswamy, K. Narayanan, S. M. Khular, (Smt.) R. Ramachandran, H.S. Kalsi & P. Thomas—NPL, New Delhi.

ACCEPTED

105861: A new method of biosynthesis of protein concentrate from gas oil, J. N. Baruah, K. Vadalkar, D. N. Borodoloi & M. S. Iyengar—RRL, Jorhat.

111491: A process for the preparation of a cation-exchange resin, V. S. Narasimhachar, Y. V. Subba Rao & R. Vaidyeswaran—RRL, Hyderabad.

111690: Improvements in or relating to inhibitive primers, K. S. Rajagopalan & S. N. Guruviah—CECRI, Karaikudi.

111847: A tractor driven mechanical salt harvester, A. S. Kane & H. N. Patel—CSMCRI, Bhavnagar.

111927: An automatic battery testing device, M. G. Potdar—CECRI, Karaikudi.

111928: Flotation cell for deinking of waste paper, M. S. Iyengar, S. B. Lodh, B. Chaliha & P. N. Phukan—RRL, Jorhat.

111957: Device and process for size separation and elutriation classification of subsieve particle size fractions, V. N. Lele & B. P. Choudhari—CSMCRI, Bhavnagar.

SEALED

101626: Improvements in or relating to the manufacture of soft ferrites, G. V. Ganapathy, S. C. Gupta, G. Govindaswamy, K. Narayanan & T. V. Ramamurti—NPL, New Delhi.

103299: A process for the production of fluxed briquettes from coals, chars, coke fines and the like, A. Lahiri, B. K. Mazumdar, A. K. Moitra, S. K. D. Gupta, S. Banerjee, B. Bose, J. M. Sanyal & R. Ghosh—CFRI, Dhanbad.

104523: A process for the production of fluxed ash coke suitable for metallurgical processes, A. Lahiri, A. K. Moitra & N. G. Banerjee—CFRI, Dhanbad.

104524: Remote indicating hydraulic load cell, R. N. Gupta & B. Singh—CMRS, Dhanbad.

105080: Odd-chain tertiary amine-*n*-oxides as surfactants and bactericides, B. H. N. Babu, P. K. P. S. Amma, S. V. Rao & K. T. Achaya—RRL, Hyderabad.

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CGCRI DEVELOPS CERAMIC SEALS AND SPACERS

Metallized high alumina ceramics are nowadays being widely used in microwave electron tubes, diodes, triodes, etc. With the development of hybrid micro-electronics (hybrid integrated circuits) in which low-loss alumina compositions are used as substrates over which the integrated circuits are printed, the demand has further increased.

Processes for the manufacture of high alumina seals and spacers and for high temperature metallization of the components have been developed by the Central Glass & Ceramic Research Institute (CGCRI), Calcutta. The work was undertaken at the instance of the Solid State Physics Laboratory, Ministry of Defence, Delhi, which required these spacers/envelopes for housing microwave crystals for the development of electron tubes, diodes and triodes which are used in electronic equipment operating at ultra-high frequency. The usual glass envelopes are not suitable, as glass has comparatively higher dielectric loss even at low temperature, which increases further with temperature. It has also lower softening point and mechanical strength.

The high alumina ceramics have several advantages. They are physically more stable at operating temperatures; possess excellent mechanical strength; their surface is suitable for taking metallization; thermal expansion matches with that of metal or alloy components; have low dielectric loss even after heating in hydrogen atmosphere or in vacuum; and the parts are machinable and therefore, can be produced to precise dimensions and in a wide variety of shapes.

Metallization of the high alumina components makes them suitable for the fabrication of vacuum tight seals. In the process developed by the institute, molybdenum-manganese alloys have been used as their thermal expansion matches well with that of the alumina body. The metallization is, therefore, quite stable. The advantages of the process are that: (1) minor process variables do not affect the process and hence it is suitable for quantity production; (2) bonding between the alumina body and the coating is strong and stable; and (3) the coating can withstand high temperature brazing which is usually done at 1100°C in vacuum or in an inert atmosphere.

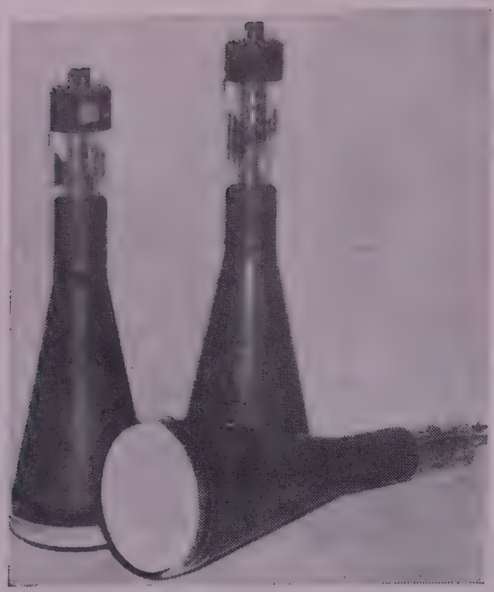
Ceramic spacers developed at the Central Glass & Ceramic Research Institute, Calcutta for use in electronic equipment. Top and bottom rows show metallized spacers

Fabrication of Cathode Ray Tubes at NPL

The project of cathode ray tube fabrication was started in the National Physical Laboratory (NPL), New Delhi in October 1968 as a sequel to a training programme given by Mr M. E. Russell of Hewlett Packard Co., USA. The following techniques connected with the cathode ray tube fabrication have been perfected: (1) deposition of phosphor in glass bulbs, (2) aquadag coating inside glass bulbs, (3) gun assembly on glass stems, (4) sealing of stem to glass bulb, (5) evacuation and processing of complete tube, and (6) testing of complete tubes.

Two types of cathode ray tubes, viz. 5AQP31 (accelerating voltage 3 kV) and 5 UP1 (accelerating voltage 1.5 kV) have been fabricated. Some tubes have been made with a greenish blue phosphor.

The University Grants Commission has placed an order with NPL for 500 oscilloscope kits with cathode ray tube type 5 UP1. Batch production of CRT type 5 UP1



Cathode ray tubes fabricated at the National Physical Laboratory, New Delhi

has been started and the electronic circuit for a general purpose oscilloscope using this tube has been standardized. The oscilloscope has the following specifications: Vertical channel—sensitivity, 10 mV (rms)/cm; frequency response, 1 db from 10 Hz to 2.5 MHz; input impedance, 3 megohms shunted by 20μμF; Horizontal channel—sensitivity, 120 mV (rms)/cm; frequency response, 1 db from 1 Hz to 200 kHz; input impedance, 30 megohms shunted by 30μμF; Sweep range—10 Hz to 500 kHz in five steps; Synchronizing—internal and external or line frequency; Cathode ray tube—5 UP1, 5 in.; screen, medium persistence phosphor.

Studies on Precorticotrophin—A Precursor of Adrenocorticotrophic Hormone

The study was carried out by Shri Pramodnarayan Dasgupta of the Central Drug Research Institute, Lucknow, who was awarded the D.Sc. degree by the Calcutta University for his thesis on the subject. A brief account of the investigation is given in the following paragraphs.

A crude sterile alkaline extract of beef anterior pituitary lobes was found to be practically free from any activity when tested by Sayers method (adrenal ascorbic acid depletion test), although such extracts could induce a definite but small increase in the weight of adrenals of hypophysectomized rats. The Sayers-inactive preparation acquired very high activity (in Sayers test) immediately after treatment with dil. hydrochloric acid to *p*H 3 or with urea (6*M*). The material which gives rise to activity in the Sayers test as a result of these mild treatments is referred to as 'precorticotrophin'.

Similar observations were made with adenohypophyseal extract in 0.9% NaCl solution. It was, therefore, apparent that precorticotrophin was not an artifact of preparation.

The existence of the pituitary factor, precorticotrophin, was demonstrated in other mammalian species such as sheep, pig, guinea-pig, rabbit and rat. The corticotrophic (Sayers) activity per mg of the pituitary tissue of sheep, pig and guinea-pig was comparable, but was considerably less than that of rat and rabbit. At the dose level of 0.25 mg wet weight of pituitary tissue per 100 g body weight of the assay animals, the pituitary gland of all species except rabbit did not show any corticotrophic activity before acid treatment. However, after acid activation of the preparations significantly high corticotrophic activity was detectable at the same dose level. It became apparent from the results that the presence of precorticotrophin in the mammalian adenohypophysis is a general phenomenon and about 80% of the total corticotrophic activity of the pituitary glands exists in the form of precorticotrophin.

It was shown that precorticotrophin after acid treatment enhanced the rate of steroid biosynthesis in the adrenal cortex of hypophysectomized rats. The corticosterone contents of both adrenal tissue and adrenal vein blood were unchanged when the rats were treated with a 0.9% saline extract of pig pituitary glands. However, by using such extracts after treatment with dil. hydrochloric acid a significantly high level of corticosterone was detectable both in the adrenal tissue and renal venous plasma.

The presence of a material behaving like precorticotrophin in the Sayers assay was demonstrated in blood samples of normal rabbit. Sera of normal blood taken by heart puncture were inactive when tested for corticotrophic activity. However following treatments with dil. hydrochloric acid or urea, it acquired significant activity. More interestingly, it was observed that sera of blood collected from the jugular vein was *per se* and treatments with acid or urea did not increase its activity; however sera of carotid arterial blood was inactive, but became highly active after treatments. It appears probabl that precorticotrophin in its native state could be released into the circulation like other principles of the pituitary as a normal physiological phenomenon.

The above evidence for the existence of precursor of a protein hormone of mammalian pituitary origin, namely, adrenocorticotrophic hormone has opened up a completely new area of research. It appears immediately important to investigate the relation between the corticotrophin releasing factor of hypothalamic origin and precorticotrophin of hypophyseal origin. In the same way it would be worthwhile to find out if precursors of other trophic hormones of the pituitary exist in the first place and secondly the position of such a precursor vis-a-vis its corresponding releasing factors. It would also be highly rewarding to undertake the isolation of precorticotrophin in a purified state and to study the mechanism of activation of this inactive principle into the active material both *in vivo* and and *in vitro*.

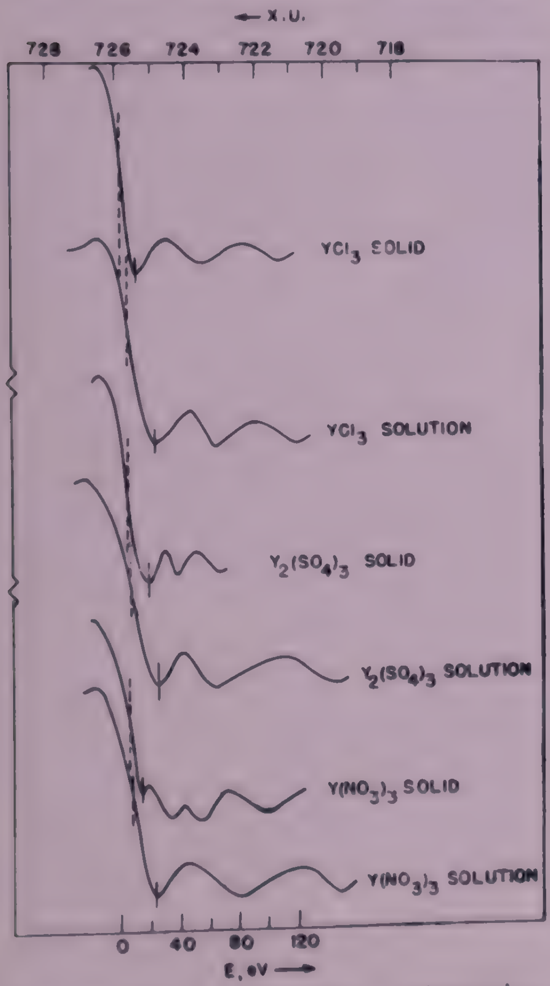
X-ray Studies of Yttrium Compounds

X-ray spectroscopic study of yttrium, the first member of the second series transition elements with the electronic structure (Kr)4d^1 5s^2 has been made by Shri N. V. Bhat of the National Physical Laboratory (NPL), New Delhi under the guidance of Dr V. G. Bhide of the laboratory. X-ray emission and absorption spectra of about 20 compounds of yttrium, having different types of ligands and chemical bonds, were investigated. The object of this study was to find out whether X-ray spectroscopic techniques can be used to investigate the elements with high atomic numbers, and to understand the nature of the chemical bond and the effect of neighbouring ligands.

Bent crystal X-ray spectrograph (Cauchois type), designed and fabricated at NPL, was used for the study. X-ray K-absorption spectrum has yielded considerable information on the nature of the chemical bond and the effect of the nearest neighbouring ligands. The extended fine structure, accompanying the edge, has been used to compute bond lengths for the compounds employing Lytle's analysis and Levy's method. The values are in perfect agreement with the bond lengths reported using other techniques. The fine structure observed for metallic yttrium has been explained partly on the basis of Hayasi's theory and partly on the basis of plasma oscillation theory for solids.

X-ray K-emission spectrum of these yttrium compounds has been investigated. The method of secondary excitation was employed in order to ensure that the compound under study does not decompose during the investigation. The shifts that occur in the positions of the X-ray diagram line such as $K_{\alpha_{1,2}}$ and $K_{\beta_{1,3}}$ have been measured. The causes of these chemical shifts have been explained.

It was thought interesting to see whether electronic structure of a semi-conductor can be deduced using X-ray spectroscopic technique. An intermetallic compound, zinc selenide, was chosen for the purpose. The X-ray K-absorption spectra of zinc and selenium have been studied in pure metals and in the compound, zinc selenide. The studies have yielded valuable information on the valence and the conduction bands in this compound.



Fine structure of yttrium K-absorption edge in three salts and their aqueous solutions

The researcher Shri Bhat has been awarded the Ph.D. degree of the Bombay University for his thesis, X-ray spectrographic investigation of some yttrium compounds.

Wealth of India: Vol. VIII

The eighth volume of this encyclopedia has been released by the Pubications & Information Directorate, New Delhi.

The encyclopedic work is based on comprehensive literature surveys on economic plants, animal products and minerals from A.D. 1900 onward and is brought out in two series: *Raw Materials* and *Industrial Products*. The volume under review is in the raw materials series and includes an account of raw materials of vegetable, animal and mineral origin. The vegetable products are dealt with under the botanical names of the plants, and are arranged in alphabetical sequence of their generic names, while the mineral and animal products are given under their English names with their scientific equivalents. Names in Indian languages, common English names, and trade names of plants, animals and minerals and their products are also given.

The 394-page volume covers the alphabetical sequence Ph-Re and contains a large number of entries—plant species, 457; animals and animal products, 5; and minerals, 5. Group-wise, the entries cover topics like animal and animal products, beverages, dyes and tans, essential oils, fats & oils, fibres and pulps, food & fodder, fruits & nuts, gums, latex & resins, medicinal plants, minerals, spices & flavourings, timber & forest products, narcotics, fumitories & masticatories, vegetables. Some of the important entries are: *Phaseolus*, *Phoenix*, *Pinus*, *Piper*, *Pisum*, *Plantago*, *Podophyllum*, *Polygonum*, *Pongamia*, *Populus*, *Prunus*, *Psidium*, *Pterocarpus*, *Pueraria*, *Punica*, *Pyrus*, *Quercus*, *Raphanus* and *Rauvolfia* among plants; porpoises & dolphins, and prawns, shrimps & lobsters among animals; and phosphates, quartz and rare earths among minerals.

Appended to the volume is a useful 12-page index which covers names in Indian languages, regional and trade names and common English names.

Printed on Indian art paper, the volume is illustrated with 9 colour plates and 142 line and halftone text figures.

Compiled by a team of experts with the collaboration of specialists in various fields all over the country, this encyclopedic volume, like its predecessors, serves as a ready reference manual for students, scientists, industrialists and others interested in the topics covered.

RRL, Jammu Annual Report : 1968

The progress of research of the Regional Research Laboratory (RRL), Jammu during 1968 has been described projectwise under its seven divisions and in its branch laboratory at Srinagar. The 57-page report (royal 8vo) which has been published recently shows that the main research programmes tackled by the laboratory were: (1) production of plant products of economic importance to lead to self-sufficiency and export; (2) development of methods for the manufacture of organic chemicals by submerged fermentation techniques; (3) utilization of the available mineral and forest resources; and (4) processing and preservation of the fruits of the region. In all 58 projects were investigated.

Detailed studies on the distribution pattern of a number of economic plants like *Skimmia laureola* (for linalyl acetate), *Dioscorea deltoidea* (for diosgenin), *Fagopyrum esculentum* (for rutin) and *Physochlaina praealta* (for hyoscyamine) have been completed. Their economic exploitation is being worked out. Botanical survey of Ladakh revealed the availability of the plants *P. praealta* and *Ephedra* spp. in quantities sufficient to meet the country's present requirements. About 120 tonnes of *P. praealta* with alkaloidal contents of 0.5-1.2% and an equal quantity of *Ephedra* spp. can be collected from this area annually.

Exploitation of *Fagopyrum tataricum*, source of rutin (vitamin P), under cultivation in the plains proved more favourable and convenient. The laboratory has developed an economic method which reduces its production cost and processing time. Fourteen different strains of *Datura strammonium* obtained from foreign countries, besides *D. sanguinea*, *D. ceratocaulis* and *D. gigantea*, have been successfully introduced in Jammu. Cultural trials carried out in the laboratory farms with *D. innoxia* have confirmed the earlier findings that it can be raised profitably as a winter crop in frost free zones. *Tephrosia vogelli*, the source of the potent vegetable insecticide rotenone, has been successfully raised in Jammu from the seeds obtained from USA. Plants showed satisfactory growth and the leaves contained 3.1% rotenone. A process for effecting an additional recovery of 13.5% crystalline menthol from dementholized oil through borate ester process has been standardized. Menthol thus obtained has better crystal structure and aroma. Oil of peppermint produced in collaboration with the Central Indian Medicinal Plants Organization compares favourably with the Bulgarian peppermint oil in respect of physico-chemical characteristics and olfactory properties.

Screening of plant materials showing therapeutic activity forms a major programme of research. It has been found that integerrimine, a white crystalline alkaloid isolated from *Crotolaria brevifolia*, exhibits marked hypotensive and spasmolytic properties. Scoparone, a natural coumarin isolated from *Antemisia scoparia*, has been found to exhibit hypotensive activity in anaesthetized dogs. The essential oil from *Tagetes minuta* showed tranquillizing, spasmolytic, bronchodilatory and anti-inflammatory properties.

Extensive deposits of sulphur, borax and potassium salts in combination with other minerals have been discovered in the Pugga valley of Ladakh. Systematic studies on their utilization, taken up in collaboration with the Geological Survey of India and the J & K Minerals Ltd, have yielded encouraging results. Total workable reserves of sulphur have been estimated at 2 20 000 tonnes and those of borax at about 6000 tonnes. Economic processes for the recovery of pure elemental sulphur and beneficiation techniques for obtaining pure borax and potassium salts from these ore materials in good yields have been worked out.

Three patent applications in respect of the following were filed: (1) a new technique for extraction of active principles from pyrethrum flowers and other cellular materials; (2) an efficient and economical method for commercial production of rutin from *Fagopyrum esculentum*, *F. tataricum*, *Eucalyptus macrorrhyncha* and other plants containing rutin; and (3) production of technical and perfumery grade citronellol from *E. citriodora*. The laboratory published 12 research papers during the period under review.

Spontaneous Combustion of Lignite Briquettes

Lectures at CMRS

The physical parameters of lignite briquettes, such as porosity, permeability, average pore diameter, etc. have direct bearing on their liability to spontaneous heating. This was elucidated by Dr Ing. K. N. P. Sinha, Principal, Mining Institute, Dhanbad during his lectures delivered at the Central Mining Research Station, Dhanbad on 10 and 12 Sept. 1969.

The talks were based on Dr Sinha's work in the University of Bgaedemie, Freiberg, Bergakademie, German Democratic Republic. In GDR the fires in lignite briquettes are of the order of 4 to 5 fires a day and occur even during their transportation.

Dr Sinha experimented on a series of lignite briquettes produced from the same lot of lignite under different briquetting pressures. The briquettes were identical from the point of view of their chemical composition but were different in respect of their physical parameters. The physical parameters such as porosity, permeability, average pore diameter, specific inner surface and the velocity of oxygen through the pores under different known pressure drops were determined by him. In his lectures he explained the theoretical considerations along with mathematical formulae involved in the determination of the different parameters. The degree of susceptibility to spontaneous heating of the briquettes, determined by him with modified Dennstedt apparatus, was shown to have a bearing on the physical parameters.

The conclusions of the study are as follows. (1) When the pressure of oxygen flowing through briquettes is maintained at a constant level, susceptibility to spontaneous heating increases with increase in permeability up to a certain value; for very high permeability it may be just the opposite. (2) When the amount of oxygen flowing through each unit cross-sectional area of briquettes is maintained constant, susceptibility to spontaneous heating varies inversely as the permeability. (3) The rapidity or slowness of reactions leading to spontaneous heating seems largely to be a function of the speed of oxygen air passing through the pores.

The method adopted by Dr Sinha for finding the air permeability may not reveal the nature of all pores as a few of them could be sack pores, yet the method could be applied to briquettes made from Indian bituminous coal. These studies could be utilized for determining the best method of stacking coal briquettes to avoid spontaneous heating. Further, the physical parameters of coal, if determined by the method adopted by him for lignite briquettes, could be of much use in the estimation of gassiness of a seam, in methane drainage, in finding correlation with strength of coal, and the rate of burning of solid coal.

CMERI Computer Training

A computer training course on 'Fortran II-D and SPS II-D Programming Languages' will be conducted by the Central Mechanical Engineering Research Institute (CMERI), Durgapur for a month from 15 Jan. 1970. The course is open to degree and diploma holders in engineering and science graduates with good knowledge of mathematics. The course comprises: (1) a series of lectures culminating in developing computer-oriented methods in relation to computer programming languages, and (2) a computer workshop for solving programming language problems. Applications on prescribed form should reach the Director, Central Mechanical Engineering Research Institute, Durgapur by 15 Dec. 1969.

CSIR SUPPORT TO RESEARCH

New Schemes

Ultimate Load Analysis of RC Structures

A new CSIR research scheme entitled ultimate load analysis of reinforced concrete structures subjected to combined flexural and torsional loadings has been taken up for investigation at the P.S.G. College of Technology, Coimbatore. Coming under the purview of the Civil Engineering & Hydraulics Research Committee the investigation is being carried out under the direction of Prof. V. Ramakrishnan, Head of the Department of Civil Engineering of the College.

Although most civil engineering structures consist of three dimensional assemblages of linear structural elements they are conceived of only as plane frames for analytical convenience. The role of the interconnecting members in the third dimension is generally ignored as secondary in character due to the tedious calculations involved in the conventional methods of analysis and the lack of clear understanding of the behaviour of structural elements under the combined action of several stress resultants, principally bending and twisting moments. The introduction of computers and the little insight gained into the behaviour of reinforced concrete structural members under the action of combined flexure and torsion through recent research have made designers and research workers realize the potential importance of the three dimensional action of structures in achieving economy. However, so far no rational method of analysis and design for reinforced concrete space structures has been proposed. Hence greater attention is being paid nowadays to evolve a suitable and simple procedure for designing such space structures. Such a design method assures 20-25 per cent economy in materials and could lead to huge national saving when viewed in the perspective of the widening activities of the construction industry of the country.

It is proposed to undertake a detailed investigation on all important aspects of the problem. Attempts will be made to establish the various factors which control the interactions between bending and twisting moments and to obtain the interaction relation applicable at cracking load and at failure. For this purpose tests on 5 in. × 8 in. rectangular beams with various amounts of longitudinal and web reinforcement would be conducted.

On the basis of the interaction obtained a suitable plastic design procedure would be evolved. For this purpose the limit design procedure recommended by Baker for plane frames would be considered for extension to include the torsional effects also in the analysis. The design method would be verified by conducting tests on right angle bents and RC bow girders.

Schemes in Progress

Design and Construction of High Voltage Selenium Rectifiers

This CSIR scheme aims at substitution of costly imported high voltage selenium rectifiers. Owing to non-availability of very high voltage selenium rectifiers, no indigenous high voltage dc cable testing sets or impulse generators are available at present. Dr B. Chaudhuri, Professor of High Voltage Engineering, Jadavpur University, Calcutta is the investigator in charge, who got the impetus to take up this research when he visited some Siemens factories in West Germany, where he found that the existing high voltage valve rectifiers of their dc cable testing laboratory were being replaced by e.h.v. selenium rectifiers.

Attempts are being made to procure the first consignment of 5000 (8 mm × 8 mm) cells required for the research. In the meantime 25 mm × 25 mm cells were procured and the following tests were carried out on each cell : static and dynamic characteristics, aging characteristics, effects of variable spring pressures, resistive and capacitive load tests and temperature rise tests.

Stacks have been designed and constructed. The construction of a 50 kV 200 mA dc selenium rectifier is nearing completion. The quality and defects of the indigenously available selenium cells, as also defects in commercially available stacked rectifiers for lower voltage rating, have been assessed.

The investigations on the construction of selenium rectifiers have reached the stage where the results could be utilized for commercial scale production of : (1) high voltage dc cable testing sets, (2) impulse voltage generators, and (3) high voltage dc supply source to electrostatic precipitators.

Construction of 175 kV dc rectifier will be taken up as soon as the 8 mm × 8 mm plates are available.

Laminar and Turbulent Flow through Permeable Media

This CSIR research scheme has been in progress since January 1969 in the Department of Civil Engineering, Andhra University, Waltair under the direction of Prof. R. P. Ranganadha Rao.

The speed of movement of water in fine soil is extremely small, being of the order of a few metres a day. The laws governing such a type of flow, called laminar flow, have been studied by earlier investigators. One such law is Darcy's law, $V=K_i$, where V is the mean velocity of flow, i is the rate of loss of head with distance and K is the coefficient of permeability. Previous investigators have focussed their attention on the determination of K for different types of soils (natural and artificial) for flow with different fluids. Darcy's law is not applicable in the case of coarse soil with large pores between soil particles. The object of the present study is to determine the relationship governing the flow of water in particular and the flow of fluids in general through highly coarse particle beds.

Fairly round hand-picked river gravels of nine different sizes were used for the study. Gravels of the smallest size passed through I. S. 120 and were retained on I. S. 85; and those of the largest size passed through 2 in. mesh wire screen and were retained on 1 in. mesh wire screen.

Studies made so far have shown that the hydraulic gradient-velocity relationship for flow of water through coarse permeable media is nonlinear and is satisfactorily described by a relationship of the form, $i=k'v^n$. As the particle size of the medium increases, n increases and tends to approach 2. For a given medium, various nonlinear flow regimes are possible with different values of n and k' describing the various regimes.

Tests will be conducted on these media with other fluids, viz. glycerol-water mixtures, kerosene and air for studying the feasibility of obtaining generalized friction factor-Reynolds number plots similar to those in pipes. The possibility of occurrence of pre-linear regimes (with $n<1$) for larger size media will also be investigated. The study of effects of particle size distribution, particle orientation and particle shape on the flow relationship is also envisaged.

Production of Aspherical Optics

Lenses and mirrors with non-spherical surfaces like cylindrical, toric, parabolic, hyperbolic and elliptical, and fresnel surfaces are known as aspherical optics. Parabolic mirrors are of vital importance in the production of searchlights which involve considerable amount of foreign exchange. Parabolic mirrors are also used in the manufacture of optical instruments for correcting aberrations of spherical optics. Cylindrical lenses are used for providing even illumination at the spectrograph slits, and along with torics are extensively used in opthalmic glasses for correcting eye defects. While there is adequate technical know-how for the production of spherical optics and the machinery required for the purpose in the country, technical know-how and machinery for the production of aspherical optics are lacking. In view of the difficulties of production there has not been any incentive even to attempt optical computation for paper design of such systems. Considerable progress has been made in other countries in this line. For example, the techniques of generation of parabolic surface by the Cam and other methods have been developed in Japan over a period of 10 years.

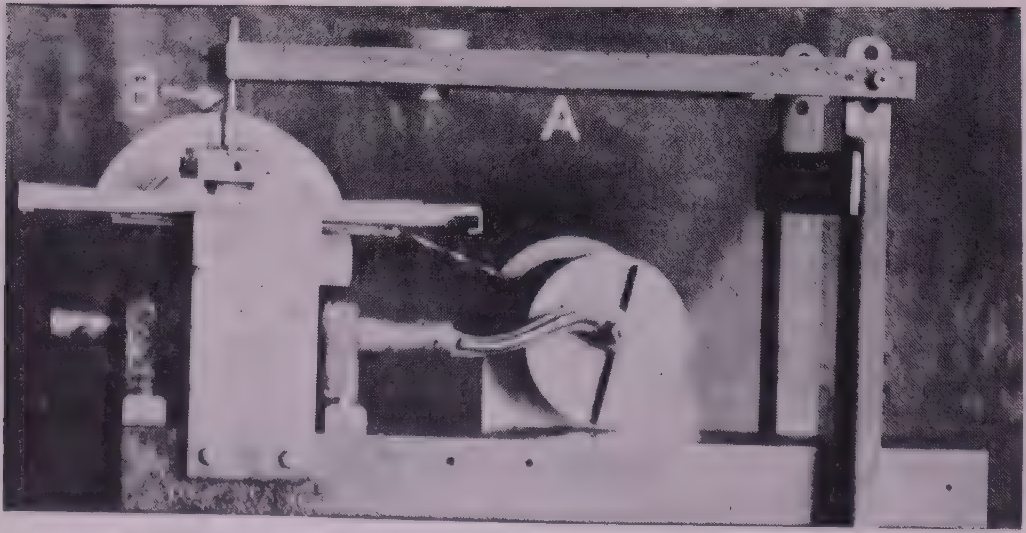
With a view to developing indigenous know-how for the production of aspherical optics, a CSIR project was taken up in the Department of Applied Physics, Andhra University, Waltair. The project, which comes under the purview of the Physical Research Committee, is being investigated under the direction of Prof. V. Ramakrishna Rao of the Department.

The main objectives of the research scheme are: (1) development of machinery for the generation of optical surfaces; (2) development of suitable tools for grinding and polishing the glass surfaces to various standards of accuracy, and (3) development of test facilities for testing tools and products.

In the course of the project, a cylindrical lens grinding machine has been developed and tested. A cylindrical lens has no curvature in one direction and a finite curvature in a perpendicular direction. To achieve this the job must be handled by a reciprocating motion along a fixed axis critically maintained. The tool B is suspended from above by the arm A to avoid the occurrence of streaks on the surface due to this regular motion. A provision is made from a perpendicular movement of the tool with respect to the job by not more than half mm amplitude. Suitable lines and guides are provided for these two motions and carefully aligned and maintained. A number of lenses (plano-cylindrical type (have been made with varying cylindrical curvature values (5, 18, 30, 33, 45.6 cm, etc.). Large single pieces are made, which can be cut into smaller sizes. Their performance has been tested for evenness of illustration along the length of image.

The machine in its present form is working satisfactorily on a small scale production of cylindrical lenses.

The design of machinery for parabolic surfaces is at the stage of fabrication of prototype.



A cylindrical grinding machine designed and developed for production of aspherical optics

Completed Schemes

Ionospheric Absorption of Radio Waves

The above scheme in ionospheric physics functioned under the aegis of the Physical Research Committee in the Department of Physics, University School of Sciences, Gujarat University, Ahmedabad for a period of 3 years from Sept. 1966. The research fellow was Shri B.M. Patel who carried out the studies under the guidance of Dr K.M. Kotadia of the Department.

A 1.5 kW pulsed wireless transmitter was built comprising high and low tension power supplies, a pulse generator, modulator and modulated oscillator and the final power amplifire. It was working in the frequency range 2.0-3.0 MHz. Other ancillary equipment was also developed.

Besides, an extensive study has been made of lunar tidal variation of ionospheric absorption on different frequencies at a midlatitude station. The following conclusions are deduced from a study of noon ionospheric absorption data at Freiburg on five different radio frequencies (1.725, 2.05, 2.44, 2.90 and 3.45 MHz) during 1956-65.

(1) The lunar daily variation of ionospheric absorption is largely semidiurnal in high sunspot period,

but a significant diurnal component is also found in low sunspot period.

(2) The amplitudes and phases of lunar variation in absorption change with solar activity, but the changes have no direct relation with the solar activity. The character of the semidiurnal lunar variation of the earth's magnetic field remains practically the same at all times and at all stations. Variation in temperature is essentially a solar diurnal phenomenon.

(3) The phases of diurnal and semidiurnal lunar variation in ionospheric absorption are different from those of the H-component of the earth's magnetic field. The latter has a diurnal maximum at about 06.00 lunar hr and semidiurnal maxima at about 08.00 and 20.00 lunar hr as found from magnetic data of Batavia. In contrast, the lunar tidal oscillations in atmospheric pressure are purely semidiurnal having maxima at 01.00 and 13.00 lunar hr.

(4) Effects such as an increase in amplitude and a reversal in phase in the lunar variation of absorption are observed when the observing radio frequency is close to the *E*-layer critical frequency.

(5) The results obtained for the lunar semidiurnal variation of absorption on 1.725, 2.05 and 2.44 MHz in low and high sunspot periods agree well with those obtained by Appleton and Beynon and Bossolasco and Elena. However, in the intermediate period, the consistency is not maintained.

(6) The well-known 'winter anomaly' in solar annual variation of absorption is also found in the lunar semidiurnal variation, and its phase in winter is not much different from that of the annual mean variation. The phases in summer are almost opposite to those in winter, particularly so in medium solar activity period.

The work on 'winter anomaly' in ionospheric absorption at mid-latitudes is interesting. The preliminary results indicate that the changes in stratospheric temperature at 10 mb pressure level have significant influence on absorption of radio waves in the *D*-layer of the ionosphere. Any departure from established law of variation in absorption with sunspot number and the sun's zenith distance can be explained in terms of such stratospheric warming, which happens to be only on some days resulting in the modification of the monthly median value of ionospheric absorption. The particular problem has an important application to radio broadcasting and communications for determining the power of the transmitter, appropriate frequency and the range of satisfactory service area. Regular observations on ionospheric absorption with an automatic equipment are scheduled to commence from the beginning of the year 1970 on five different frequencies in the range 1.8 to 3.5 MHz.

UN Seminar on Scientific & Technical Manpower

Shri K. Ray, Scientist-in-charge, Division for Scientific & Technical Personnel, CSIR, New Delhi represented India at the United Nations Inter-regional Seminar on 'Employment, Development and Role of Scientists and Technical Personnel in the Public Services of Developing Countries' held during 1-14 October 1969 at Tashkent, USSR. The purpose of the seminar was to strengthen scientific and technical staffing in the government sector which is generally increasing or planning to increase it at a rapid rate for national development.

Twenty-seven countries participated in the seminar. International organizations like Unesco, WHO and the IIAS (International Institute of Administrative Sciences) also sent their representatives. There were five international consultants one each from Argentina, Ghana, Japan, UK and the USA. Ten Soviet consultants from the host country, USSR, contributed substantially to the deliberations.

Government are now the largest users of scientific and technical personnel the world over. Besides, government sector deals with wide varieties of functions which, at the present age, concern science and technology directly or indirectly. Being also a highly organized sector, the government of a country is in a position to introduce reforms in its service structure of scientific and technical personnel, These were the considerations on which the deliberations in the seminar were largely confined to the government sector. The seminar, however, compared and contrasted this sector with the private sector where the dual system existed in any country.

In some countries there is competition between the two sectors to retain and utilize the scientists and engineers. This is a form of internal brain drain, as it was called. It was felt that the flow should not be stopped, but there should be healthy and planned mobility between the two sectors. The external brain drain was also discussed fairly widely as the topic came up from time to time. All the countries do not have the same problem. Some countries (particularly African countries) have meagre manpower resources and most of their scientists and technologists are sent out to advanced countries for education and training. Many of the highly specialized personnel do not fit into their working schemes and the countries concerned realize that it is neither possible nor desirable to hold them down. On the other hand, the loss of the younger trainees to the advanced countries was considered very undesirable. Some countries have the problem of shortages, others have the problems of providing employment to their trained scientific and technical personnel.

The seminar recognized the fact that education and training should be oriented towards the country's needs. It was also highly appreciated from the papers and discussions presented by the Soviet delegates that, in the modern context, the scientific and technical staff in service become out of date in course of 10 to 15 years. They become unsuitable to catch up with the modern trends unless the scientists, engineers and managerial personnel are periodically re-trained through special courses. Many other advanced countries also follow this principle.

The seminar mainly recommended the various methods of incentives to attract, retain and encourage scientific and technical personnel in the government services through the system of better pay scales and flexible service conditions, promotional and bonus incentives.

Open Days in National Laboratories

'Open days' observance is a regular feature when the laboratories get an opportunity to throw open the research divisions and workshops to the gaze of the public with a view to acquainting the visitors with the research activities and testing facilities available. Demonstrations are given, working models exhibited and guides provided to take the visitors round.

The Central Food Technological Research Institute, Mysore held open days on 24 and 25 Oct. 1969. Demonstration of processes developed by the institute, display of exhibits and scientific and films on food technology marked the occasion.

The Central Scientific Instruments Organization (CSIO), Chandigarh arranged open days during 28-30 Oct. 1969. A wide variety of working models of instruments, components and machinery developed by the organization were at display at its prototype instruments centre. The open days provided an opportunity to CSIO to get to know the problems faced by entrepreneurs in the instrument manufacturing industry.

The Central Mining Research Station, Dhanbad held an open day on 2 Nov. 1969. Exhibits relating to mining technology, mining safety, mine engineering and mine health were put up. Over 60 demonstrations of the processes and equipment developed by the station were given. Films on mining techniques were screened. A brochure (mimeographed) listing the achievements was brought out on the occasion.

DEPUTATIONS

Shri S. K. Suri, Scientist-in-charge, Instrumentation and Servicing Section, National Physical Laboratory, New Delhi worked as consultant at the Unesco-aided Fine Instruments Centre, Seoul (Korea) for a period of 3 months (1969). Shri Suri's specific assignment was to teach instrumentation for sophisticated laboratory instruments viz. colorimeters, spectrophotometers, flame photometers and transducers, and electronic measuring instruments used in the laboratory. He also offered his expertise in setting up an instruments service cell and trained technicians for it.

Dr A. R. Verma, Director, National Physical Laboratory, New Delhi was deputed to attend, as leader of the Indian delegation, the eighth International Committee for Crystallography held in New York from 13 to 24 Aug. 1969.

Dr Y. Nayudamma, Director, Central Leather Research Institute, Madras left for London on 31 Aug. 1969 to visit some tanneries, leather auxiliary firms and leather manufacturers' research associations and to attend the Conference of the International Union of Leather Chemists (7 to 12 Sept.) Dr Nayudamma thereafter took up an assignment as Consultant to FAO in Rome for two months effective 16 Sept. 1969. He is scheduled to visit Somalia, Kenya, Rwanda, Nigeria, Sudan, Iran and Turkey in connection with the consultancy work.

Shri J. S. Gadgil, Scientist, Central Public Health Engineering Research Institute, Nagpur left for Japan on 2 Oct. 1969 for a period of 6 months for training in the field of biochemistry and microbiology applied to industrial waste treatment under the Colombo Plan training programme.

Shri N. N. Chatterjee, Scientist, Central Fuel Research Institute, Dhanbad left for Warsaw on 5 Oct. 1969 on deputation for 3 months to study process developments in coal utilization under the scientists Exchange Programme between CSIR and the Polish Committee for Co-operation with Foreign Countries.

Dr H. S. Rao, Scientist, Central Fuel Research Institute, Dhanbad who was on deputation to USA under India-US Exchange Programme of Scientists resumed duty on 6 Oct. 1969. Dr Rao participated in the Gordon Research Conference on Coal Science (1969) at Tilton, New Hampshire where he spoke on coal pyrolysis. He later visited some coal research centres in USA and studied the latest trends in coal research and utilization.

PATENTS

ACCEPTED

112125: Improvements in or relating to chemical preparation of silver selenide powder, C. V. Suryanarayana, N. Rangarajan, K. N. Rao & M. J. Mangalam—CECRI, Karaikudi.

112160: Processes relating to the use of cardanol for the production of pale coloured coating materials and adhesives, B. G. Murthy, M.A.S. Samban, J. S. Aggarwal, S. P. Gulati & M. S. Ramaiah—RRL, Hyderabad.

112185: Improvements in or relating to flywheel synchronization circuits for TV receivers, S. K. Goyal & L. Singh—CEERI, Pilani.

112207: Improvements in or relating to open-web steel sections for structural use, K. V. Shetty —CMERI, Durgapur.

112217: An injected beam crossed field tube, R. P. Wadhwa & G. S. Sidhu—CEERI, Pilani.

112301: Emulsion paint vehicles from styrenated copolymers of drying and semidrying oils, P. Narasimham, M. Yaseen & J. S. Aggarwal—RRL, Hyderabad.

112388: Improvements in or relating to the use of the residue obtained during the distillation under reduced pressure of cashewnut shell liquid in the preparation of varnishes, enamels and paints, T. Ramalingam, B. G. Murthy, M. A. S. Samban & J. S. Aggarwal—RRL, Hyderabad.

112440: Improvements in or relating to portland cement coatings for steel, K. S. Rajagopalan, N. S. Rengaswamy & T. M. Balasubramanyan—CECRI, Karaikudi.

112473: Improvements in or relating to beneficiation of natural graphite, R. Subramanian, S. Chakrapani, R. Venkatachalam & B. A. Shenoi—CECRI, Karaikudi.

SEALED

103115: Photographic enlarger timer, S. Dasgupta & P. K. Basu—CMERI, Durgapur.

105686: A process relating to the production and isolation of *p*- and *o*-xylenes from coke oven or naphtha based *m*-xylene cuts or *m*-xylene, R. N. Bhattacharya, N. V. R. Apparao, G. S. Murty, H. S. Rao, N. G. Basak & A. Lahiri—CFRI, Dhanbad.

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INDUSTRIAL TOXICOLOGY RESEARCH CENTRE

Foundation-stone Laid

The foundation-stone of the buildings of the Industrial Toxicology Research Centre (ITRC) at Lucknow was laid by Shri V. V. Giri, President of India on 5 Nov. 1969. In 1965 the Council of Scientific and Industrial Research established the centre with a view to conducting experimental study on the mode of action of toxic substances encountered in industry, agriculture and mine and elucidating the mechanism of tissue injury and suggesting therapeutic and preventive measures.

The President expressed immense satisfaction over the establishment of Industrial Toxicology Research Centre at Lucknow which has been giving a good deal of attention to the health and security of the labour class. The President observed that although industrialization is indispensable for the progress of a country it also brings, in its train, certain inherent dangers to the health of the workers. This is more evident in a developing country, like ours, where the phased programme of industrialization introduces, almost every day, new raw and hazardous substances of unknown toxicity in various industries and consequently jeopardizes the health of the industrial workers by polluting the working environment. A number of occupational diseases are, therefore, becoming common and new disease conditions are being recognized. It is not only a scientific problem but also a serious human problem. He further added, "As a consequence, millions of our working people belonging to different trades and professions are exposed to harmful effects of these hazardous substances. The professed aim of the centre should be to protect, safeguard and preserve the health of the worker against such hazards and improve his usefulness, performance, speed, safety and efficiency in work". Concluding his speech the President exhorted the industrialists of the country to extend their full cooperation in this noble effort and take full benefit of the services of the centre.

Dr S. H. Zaidi, Director, ITRC, read out the message of Prof. V.K.R.V Rao, Union Minister of Education & Youth Services and Vice-President, CSIR. He said, "While mankind is generally thankful to science and technology for the myriads of benefits they have brought to us, we cannot be oblivious of the dangers they have unfolded in the living and the working environments. The chief danger is the risk experienced by the industrial workers in being increasingly exposed to toxic chemicals in industrial operations of a factory, workshop or a mine. With increase in industries the number of industrial workers is also increasing in our country. We already have a large working class which needs special care of the society if efficiency and high production in industries are to be maintained. No country can think of increasing production and maintaining a high efficiency of operation by neglecting the health of the working class. It is with this consideration that the Council of Scientific and Industrial Research decided to establish the Industrial Toxicology Research Centre at Lucknow. This is a welcome measure, exactly in keeping with the need of the hour. In a country given to rapid industrialization it is also necessary to conduct scientific research on how to protect the industrial worker from industrial hazards".

Dr B. Gopala Reddi, Governor of Uttar Pradesh, hailed the decision of locating the centre at Lucknow and wished every success to the organization.

Dr Atma Ram, Director General, Scientific & Industrial Research, welcomed the President and said, "This centre is, in a sense, a part of the overall activity of the nation to create a welfare society in which the working community can share the benefits of a happy and healthy life through the application of science and technology". He further observed, "Today research has proved beyond doubt that efficiency and higher productivity in industry can be attained through better utilization of raw materials and human resources. A worker spends a considerable part of his life at work. Promoting research in the field of industrial toxicology in the wake of industrialization is, undoubtedly, a matter of national importance and deserves support from public, government and industry".

Dr Zaidi gave a brief account of the research activities carried out at the centre. Dr K. A. Hamied, Chairman, Executive Council, ITRC, proposed a vote of thanks.

Research Contributions of ITRC

Manufacture of dyes has occupied a prominent place in the industrial growth of India. Their requirements are rapidly increasing in textile industry, in agriculture and in the manufacture of certain chemicals. Certain dyes cause cancer, allergy, blood disturbances, pigmentation of the skin and abdominal ailments.

Recently a problem on the harmful effects of benzanthrone dye was referred to the centre. The dye produced skin pigmentation and gastro-intestinal disturbances in the workers. The centre has conducted experiments on animals and suggested that the administration of ascorbic acid in high doses may help workers in the prevention of pigmentation. This trial is being conducted in the factory.

India is the second largest producer of manganese in the world. This important industry employs nearly a lakh of workers who are exposed to the hazards of manganese dust. Manganese poisoning causes serious disability to workers in the form of incoherent speech and altered gait. Research at ITRC has indicated that the brain damage is possibly due to the direct action of this metal on the brain tissue. Various agents are being studied to remove manganese from the body.

In India over half a million workers engaged in mining industry are exposed to dust hazards. Research on the relationship of nutrition and the diseases of lung caused by dust has so far not been conducted. The possible reason may be malnutrition, which is a problem of the developing countries. Extensive studies at ITRC on this problem have shown that malnutrition does not alter the course or the extent of the disease. This observation was reported to the Sixteenth International Congress on Occupational Health in Tokyo in September 1969.

Research on the toxicology of pesticides, which is of great significance to agriculture, has been initiated. It is hoped that the investigation will help in the understanding of these ailments and may give data which may prove useful for their prevention and cure. A healthy worker will bring not only better production in industry but also prosperity to the whole nation.

Seminar on Industrial Toxicology

The foundation-stone laying ceremony was followed by a two-day seminar on 'Industrial Toxicology' organized by the centre. The seminar was inaugurated by Dr Atma Ram, Director General, Scientific & Industrial Research on 5 Nov. 1969. Besides delegates, the seminar was largely attended by representatives of the industry and research workers of the Lucknow University, Lucknow Medical College, the Central Drug Research Institute, the National Botanic Gardens, the Central Indian Medicinal Plants Organization and other scientific institutions of the town. The seminar was held in four sessions.

The first session dealing with 'Dyes and industrial carcinogenesis' (chairman : Prof. S. C. Misra, Head, Department of Surgery, K. G. Medical College, Lucknow) focussed attention on various facets of industrial carcinogenesis and suggested preventive steps for mitigating this menace threatening the life of the workers. The second session on 'Industrial Pulmonary Diseases' (chairman: Prof. P. K. Ghosh, Editor, Indian Journal of Industrial Medicine, Calcutta) highlighted the work on industrial pulmonary diseases carried out at ITRC. In the third session (chairman : Dr P. C. Dutta, Head, Department of Organic Chemistry, Indian Association for the Cultivation of Science, Calcutta) the toxicity of various chemicals and metals, specially manganese toxicity, was discussed in detail. The toxicity of pesticides used in agriculture was discussed in the fourth and final session held under the chairmanship of Prof. P. K. Ghosh.

Emphasizing the role of the Industrial Toxicology Research Centre at the end of the sessions Dr Zaidi observed that this centre is the only one of its kind in the whole of Asia, including Australia conducting this specialized research. Even in the rest of the world there are very few such institutions. Industrial toxicology, in terms of its application to industrialization, is a science of recent origin and, therefore, has opened a good opportunity for our scientists to solve new challenging problems posed by the industries and to make useful discoveries to help the workers. The centre has to solve not only the health problems of miners and labourers of India but also of the ailing labour community of other countries. This heavy load of responsibilities will be shouldered with courage and confidence by the staff of the centre.

Indian Thysanoptera

Indian Thysanoptera—the first in the zoological monograph series—has been brought out by the Publications & Information Directorate.

Insects belonging to the Order *Thysanoptera*, commonly called thrips, are of much economic importance. Many of these insects are pests of agricultural, horticultural and vegetable crops; some also act as vectors of certain bacterial, fungal and virus diseases of plants. These insects have been causing concern to both the systematic and applied entomologists for over two decades. A detailed account of these insects has long been felt.

The work is the outcome of the research on thrips in India carried out by the author, Dr T. N. Ananthakrishnan, Director, Entomological Research Unit, Loyola College, Madras for the past 23 years.

The monograph is well illustrated and more than 400 species of thrips belonging to about 200 different genera have been dealt with. In keeping with the modern trends in zoological studies, emphasis is laid not only on morphological details but on ecological aspects correlated with structure. A detailed key to the Indian genera, based on the structure of wings and feeding apparatus and a key for identifying sub-families, based on the larval structures have been included. Life-cycles in both the sub-orders of thrips have been briefly described. Structural diversity in natural populations and implications of polymorphism have also been explained. An interesting chapter in the book deals with the incidence of thrips as pests in agriculture and horticulture.

An appendix listing all Indian species with cross references to the original sources and an exhaustive bibliography containing 345 references are valuable additions to the publication.

The monograph would prove useful to students, teachers and to those engaged in the field study of insects causing damage to plants of economic importance.

The publication (royal 8vo; pages 180) is priced Rs 12.00 (Sh. 24, $ 3.50) and is available from the Sales & Distribution Officer, Publications & Information Directorate, Hillside Road, New Delhi 12.

WATER DESALINATION

Research & Development Work at CSMCRI

Water is an essential commodity of everyday life. Although water is nature's abundant gift, it has attracted considerable attention during the last few years owing to serious shortages felt in certain parts of the world. With the rapid industrialization and population growth, this common and abundant commodity is becoming insufficient, even though attempts have been made for fuller utilization of the available natural water resources. It has become necessary to adopt different desalination techniques to convert hitherto unused and unsuitable saline water resources, including seawater, into good quality water. In USA available stream flow of fresh water stands at 5 60 000 million gallons per day of which at present 3 25 000 million gallons per day are used. It is estimated that by 1980 the need will be 5 59 000 million gallons per day. Water scarcity is a big hurdle in the development of many arid regions of the world.

Other countries also will be facing a similar situation some time or the other and hence many countries in the world are concerned with the research and development work on desalination. Developmental work on the techniques of desalination are vigorously being pursued in USA, USSR, Israel, UK and other countries. The main goal of all this effort is to reduce the cost of water. Therefore, popularity of distillation methods coupled with the generation of nuclear energy for high capacity plants is in the forefront. Although the costs of desalination of water are still very high, desalted water is now accepted as a major source of potable water. There is also a growing trend towards high capacity plants. A flash distillation plant of 2 50 000 m³/day (55 million gallons/day) was reported to be under construction in USSR during 1967-68. In future, 2 000 MW nuclear reactor plants coupled with 1 000 million gallons/day desalination plants are bound to be developed. There are prospects of agro-industrial complexes having very huge capacities of water and power production.

Work on Desalination in India

All the natural water resouces have not been fully exploited in India. Water scarcity poses a great problem in some states, such as Rajasthan and Gujarat. Shortage of water supply in big industrial cities like Bombay, Madras and Calcutta has become chronic.

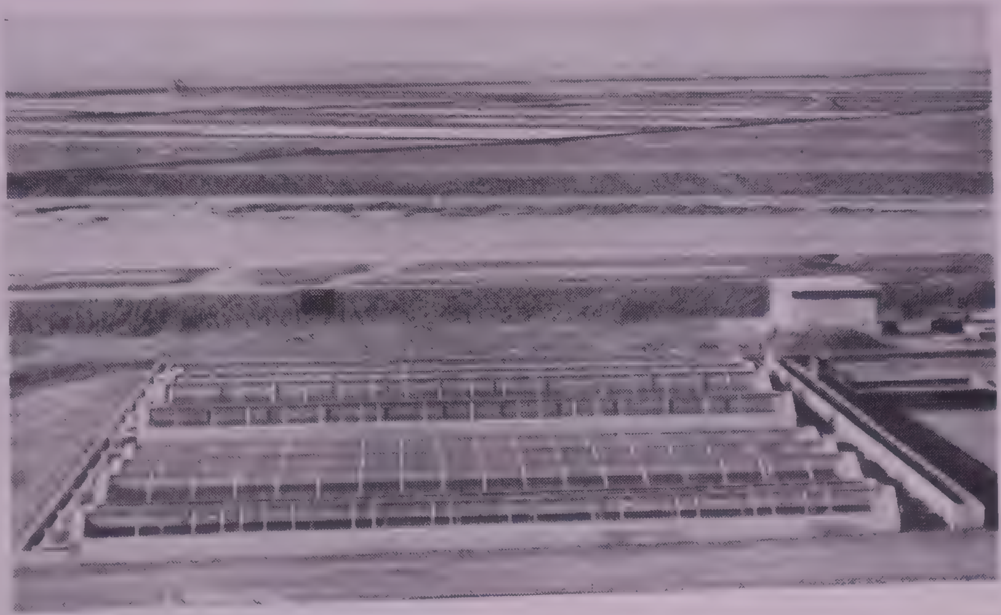
As part of the programme of solar energy utilization, some laboratory experiments were conducted by the National Physical Laboratory (NPL), New Delhi on solar distillation (solar stills). Apart from NPL, the Defence Laboratory, Jodhpur also did some experimental work on solar distillation to meet defence requirements and now this laboratory is carrying out laboratory studies on electrodialysis and some other techniques. But at present major work in the field of desalination is being done at the Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar. With the applicability of nuclear energy for desalination, the Bhabha Atomic Research Centre (BARC), Bombay is going ahead with studies on high capacity nuclear desalination plants. The centre is also interested in the project on agro-industrial complexes around these plants.

Desalination Work in CSMCRI

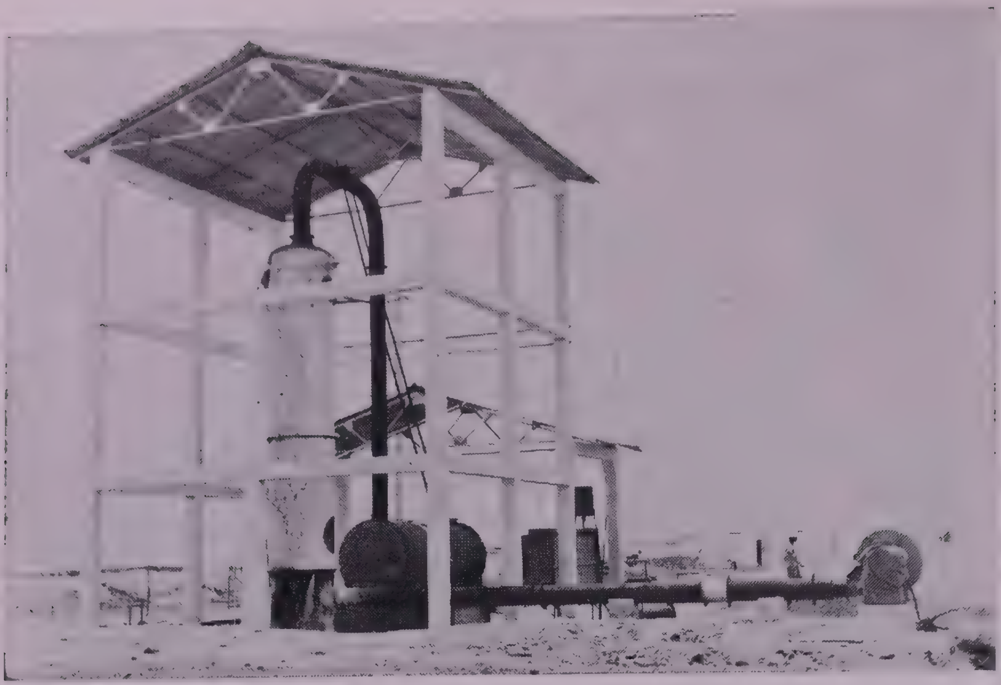
The project of desalination was initiated in CSMCRI in the latter half of 1963. Initially it was decided to take up work on solar distillation keeping in view the small scale requirements in sunny arid regions of Gujarat and Rajasthan.

Solar Stills. After laboratory experiments, a pilot plant with a capacity of about 1 000 litres/day was constructed and put into operation in August 1965. With the available experience and promising possibilities of combination of solar distillation and rainfall collection, this technique has been suggested for adoption in salt works, lighthouses and for smaller communities. Solar stills conforming to the design supplied by the institute were constructed in 1968 and are operating on Navinar Lighthouse near Jamnagar. Certain improvements in this simple technique are envisaged.

HD Technique. By the middle of 1965, work on another technique known as humidification-dehumidification (HD) technique based on solar energy utilization and having certain advantages with regard to capacity over solar stills was started. Proceeding stepwise from laboratory experiments, a pilot plant of 5 000 litres/day capacity was designed and constructed and was put into operation in the middle of 1967. Due to the difficulties faced with the use of indigenous



Experimental solar still pilot plant with capacity of 1 000 litres/day of fresh water constructed at the institute. Seen at right are feeding channel for solar stills and fresh water supply tank and at left is the drain channel for discharge from stills and for rain water



Pilot plant, utilizing humidification-dehumidification technique (capacity 4 500 litres/day). The humidifier (packed tower) and the dehumidifier (condenser) placed horizontally are the major components of the plant

plastic in the solar collectors for heating seawater, the technique was slightly modified. This technique could be easily utilized by the industries using seawater (or saline water) for cooling to recover fresh water partly from the hot discharge.

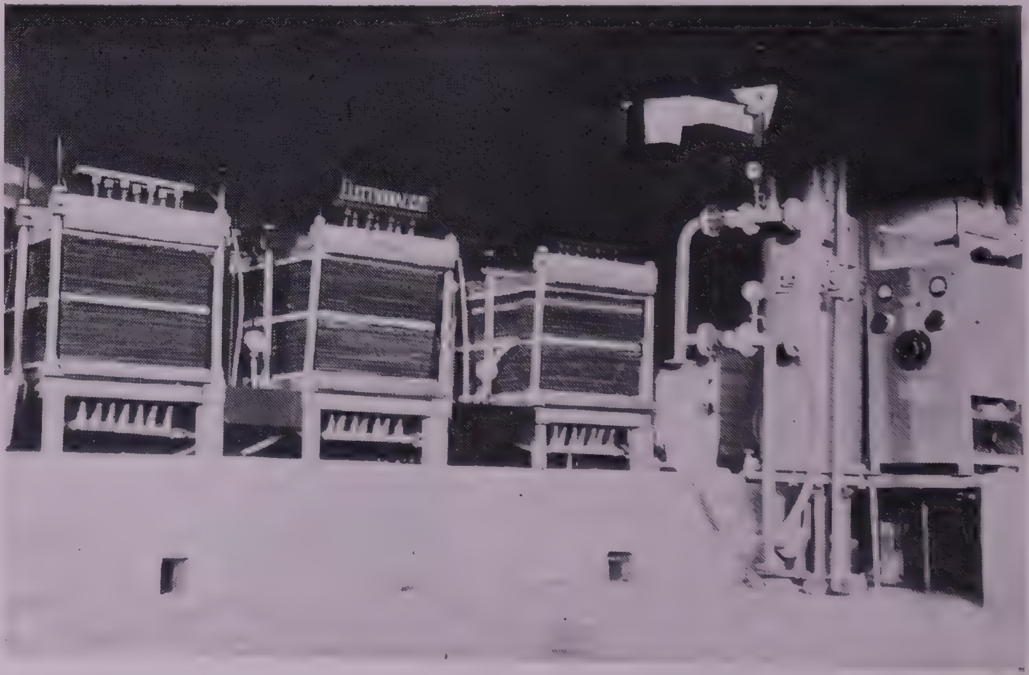
The institute has worked out a suitable design of HD plant for seawater desalination at the instance of the Bombay Port Trust for use at Prong's Lighthouse.

Electrodialysis. In 1966 the institute started development work on ion-exchange technique and electrodialysis process for treatment of brackish water. Starting with the laboratory units many bench scale trials with electrodialysis units developed in the institute (earlier work was done at the National Chemical Laboratory, Poona) were carried out for the treatment of brackish water available in Bhavnagar and also in Rajasthan. The institute has entered into an agreement with the Industrial & Agriculture Engineering Co. (IAEC) for fabrication and supply of units. Fabrication of ion-exchange membranes according to the patented procedure is entrusted to the institute.

On the recommendation of the coordination committee set up as a result of the conference on water desalination at CSMCRI in Nov. 1967 the institute reorganized its research programme on electrodialysis to meet the specific requirements of the defence forces. A unit having a capacity of about 14 m³/day (3 000 gallons/day) was fabricated with the help of IAEC and was tested in 1968 at the premises of Parshuram Pottery Works, Morvi. The portability of units has also been examined. Along with such field trials, studies for improving the quality of membranes, on different process variables, construction materials and electrodes, etc. is under way. At the instance of the Research and Development (Engineers) of the Defence Organization the institute has taken up the fabrication of a prototype plant for their use.

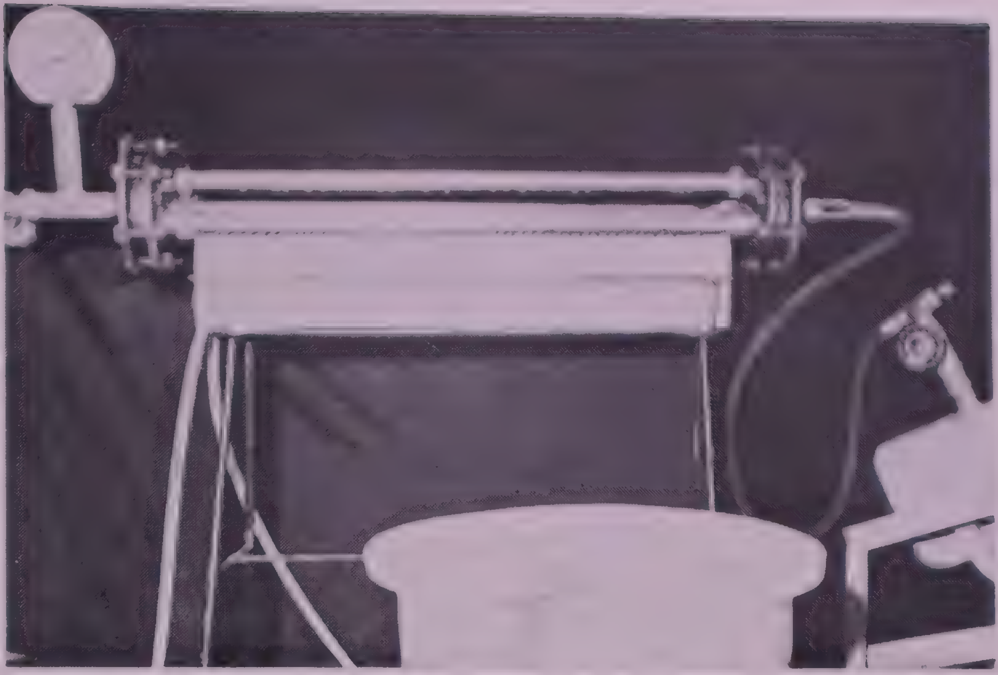
Reverse Osmosis. Development work on reverse osmosis, one of the most promising methods of desalination, was taken up in early 1968. Studies on the preparation of both flat and tubular membranes are in progress. Cellulose acetate supplied by Eastman Kodak Co. of USA has been used for the preparation of membranes and simultaneously work on the development of suitable indigenous cellulose acetate is being carried out. A cell using flat membranes of filter press type was fabricated and tried and units with tubular membranes are under experimentation. Flux rates between 400 litres/m² × day (about 8 gallons/ft² × day) and 1000 litres/m² × day (about 20 gallons/ft² × day) with 85% salt rejection have been obtained. Units using flat and tubular membranes with the capacity of 2 500 to 5 000 litres/day (500 to 1 000 gallons/day) are under fabrication.

Flash Distillation. At the instance of the Coordination Committee on Water Desalination the institute has undertaken work on the development of a suitable desalination plant for sea going vessels. Accordingly the design of a 30-tonne per day capacity desalination plant for INS Darshak was supplied to



Electrodialysis pilot plant set up at Morvi to treat water containing 5 000 ppm dissolved solids down to 1000 ppm with an output of 13 500 litres/day product water. The three stage electrodialysis stacks in series are at left, while the filters and power source respectively are at right the naval authorities. Exploratory studies on other desalination techniques are in progress.

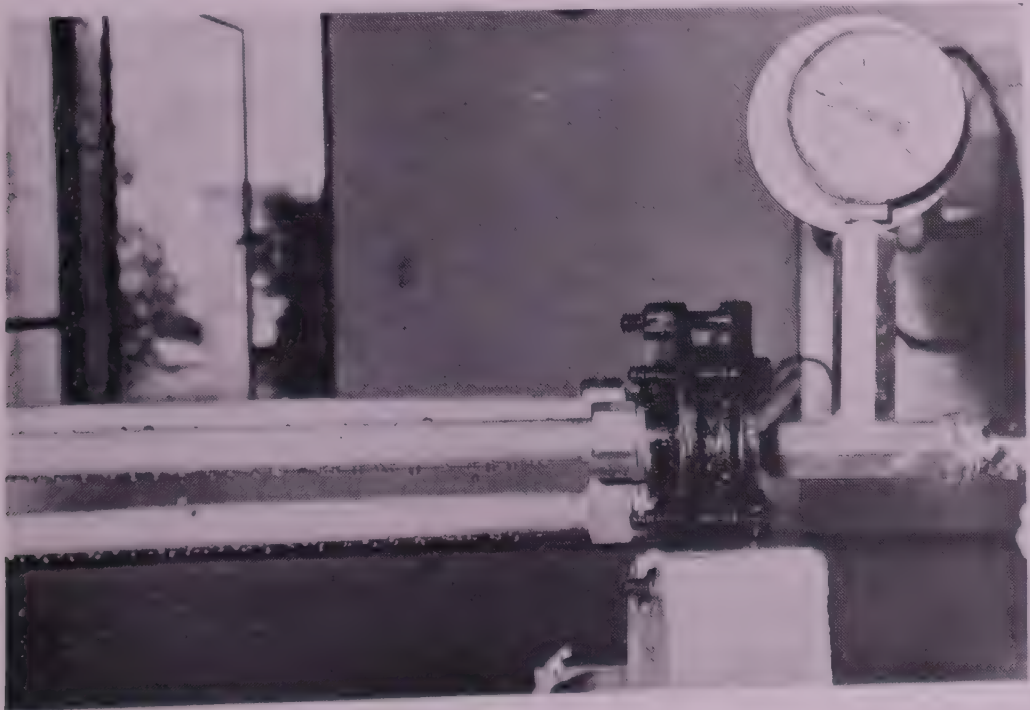
The techniques being developed in the institute are capable of giving a solution to the immediate problem of adequate water supply. The techniques can treat brackish water or seawater and can be used to meet the water requirements which can be classified as follows: (i) small scale requirements for smaller communities and isolated groups and defence purposes with capacities ranging from a few hundred litres to a few thousand litres per day; (ii) medium scale requirement—for industries, sea going vessels and supplementary water supplies in urban areas up to a capacity of 20 000 m^3/day (5 mgd); and (iii) large scale requirements for big cities and agricultural purposes with capacities more than 20 000 m^3/day.



Tubular laboratory unit for desalination of brackish water to potable water. The effective area of the unit (1½ sq.ft) gives 10 gallons/sq. ft/day with 90% rejection. It handles brackish water of salinity between 5 000 and 10 000 ppm in single stage

Large Desalination Plant. Development of large scale plants is always preferred with dual-purpose nuclear plants. This problem falls within the purview of BARC and the institute will share with BARC the information on byproduct recovery from effluent of desalination plant which can bring down the cost of desalted water and design parameters for distillation plants for desalination. These data have accumulated in the course of extensive studies carried out in the institute on the recovery of chemicals from seawater during the last decade and a half. The institute prepared recently a feasibility report on integration of marine chemicals in the agro-industrial complex around the proposed nuclear power-cum-water desalination plant (capacity 150 million gallons) on Kutch-Saurashtra coast.

With a view to disseminating information on desalination research being carried out in India and elsewhere, the institute has set up a Desalination Information Centre at its premises. This centre also brings out a quarterly entitled 'Desalination News'.



A sectional view of the reverse osmosis tubular unit in operation at the institute showing fresh water trickling out from the osmosis tubes

Patent Documentation Service

CMERI Starts New Service

With a view to disseminating patent literature under classified heads, the Central Mechanical Engineering Research Institute (CMERI), Durgapur has published a pilot fascicule of the proposed monthly 'Patent Documentation Service: A classified list of patent literature'. Exclusively devoted to patent literature the pilot fascicule (mimeographed) contains classified information on such wide fields as acoustics, crystallography, mechanical engineering, electrical engineering, chemical engineering, food industry, insecticides, metallurgy, cameras, book binding tools, fuel, etc. Each entry includes the names of the inventors, title of the invention, name of the issuing country, patent number, date of acceptance and finally brief abstract of the specification. The patents have been classified according to the Universal Decimal Classification. The publication contains patent information taken from 'Official Gazette of the United States Patent Office' and 'Gazette of India, Part III, Section 2'. Subsequent issues will include patent information from other countries.

SERC Annual Report 1968-69

The annual report of the Structural Engineering Research Centre (SERC) for 1968-69 records the progress of research under the following main heads: (1) Economical roofing schemes for industrial structures; (2) Design of reinforced concrete structures; (3) Multistoreyed buildings; (4) Partially prestressed concrete; (5) Digital computation; (6) Steel structures; and (7) Experimental stress analysis. An experimental precast prestressed hyperboloid shell structure of 12 m span and 31 m length was designed primarily to solve practical problems in casting, stacking and erection of such units. Studies have shown that this method of roofing has several advantages viz. (1) the roof is economical in the consumption of steel and concrete; (2) it is maintenance-free; (3) it easily lends itself to north light arrangements; (4) the process of manufacture is extremely simple; (5) the shape of the precast unit is such that it facilitates easy drainage; (6) the roofing can be supported on simple masonry walls; and (7) the precast unit enables speedier construction.

A significant achievement of SERC was in regard to cold worked grip bars. The bars, produced by the Tata Iron & Steel Co. in collaboration with the centre, were subjected to exhaustive proving tests. The ultimate strength of the bars has been found to be 20% higher than their 0.2% proof stress. The most distinctive feature of the grip bar is its excellent performance in bond strength, which is greater than 200% of that of mild steel bars of the same diameter at a free end slip of 0.25 mm.

The centre developed a method for complete analysis for shear-walled buildings. The analysis is carried out in two stages. In the first stage of analysis the deflected shape of the structure is arrived at using the twin cantilevers method. The moments in the individual members for the deflected shape are obtained in the second stage of analysis using an iterative procedure based on the slope deflection method. Symmetrically arranged shear walls and frames can be analysed by this method. With some modifications the method can also be applied to the analysis of multistoreyed buildings with eccentric loads or with unsymmetrical arrangements of shear walls and frames. Methods for analysis of (i) coupled shear walls subjected to parabolic loading, (ii) shear-walled building subjected to seismic loads, and (iii) multistoreyed buildings having rigid floors have been worked out.

A computer programme for stability analysis of frameworks has been developed and tested. Another project on which considerable progress has been made relates to the development of standard designs of transmission line towers. A computer programme for the analysis of folded plates using stiffness matrix method has been developed and is being used for the analysis of folded plates and box girders.

Open web joists have been standardized for loads of 400, 600 and 800 kg/m run according to the stresses permitted by IS 800 using IS angles and round bars. The span of these joists varies from 2.5 m to 12 m in steps of 0.5 m and depth from 20 cm to 60 cm.

A method has been developed for the analysis of three-dimensional prestressed stiffened and unstiffened cable systems considering the non-linear stress-strain characteristics of the cable and the large deformation of the structure. Theoretical results have been found to be in good agreement with those reported in literature. The centre has also developed a method for the analysis of continuous cylindrical shells of arbitrary cross-sections subjected to arbitrary loading. This is an extension of the work done on the analysis of box girders and other thin walled sections.

An important publication activity of the centre was the publication of the 'Handbook for Prestressed Concrete Bridges', which is a compilation of prestressed concrete girder sections in the span range 7.5-36 m.

The centre provided structural designs for the Guru Gobind Singh Hall, Punjabi University, Patiala and the pavilion at the Gandhi Darshan Exhibition, Delhi.

The centre published 24 research papers during the period under review.

CSIR SUPPORT TO RESEARCH

New Schemes

Studies on Wilt Disease of Sugarcane

Wilt disease of sugarcane, which is caused by the fungus *Cephalosporium sacchari*, was not common in the past in Andhra Pradesh. In recent years, however, its occurrence has become more common. Earlier investigations on red-rot, another stalk rotting disease of sugarcane, have revealed that *C. sacchari* is found in association with red-rot organism. Two strains of the causal organism were found to occur. In the present research project (Retired Scientists scheme), which is being investigated by Dr P. Prakasam at the Sugarcane Research Station, Anakapalle (A.P.) it is proposed to study the flora of *C. sacchari*. The study envisages in the first phase collection of diseased canes from different sugarcane regions of the state, isolation of the associated organisms, study of morphological and cultural characteristics, study of pathogenicity and comparative virulence with a view to distinguishing strains. The second phase includes a study of the synergistic effects produced when the organism occurs in association with red-rot organism. Healthy canes will be inoculated with pure cultures of *C. sacchari* and *Physalospora tucumanensis* separately, and with a mixture of the cultures of the two organisms. The inoculated canes will be examined after allowing a period of incubation. The third phase of the study will include complicity of *Fusarium moniliforme* in the causation of wilt disease in sugarcane.

Schemes in Progress

Mechanism of Bromination

The role of halogen carriers such as zinc chloride and iodine bromide in the bromination of anisole and the kinetic isotope effects in aromatic bromination are being investigated under a CSIR scheme entitled 'Mechanism of Aromatic Substitution: Kinetic Isotope Effects in the Halogenation of Aromatic Compounds' under the principal investigatorship of Dr N. S. Gnanapragasam, Department of Chemistry, Loyola College, Madras since August 1967. Shri N. Joseph is the assisting research fellow.

The bromination of anisole in 85% aq. acetic acid at 30°C is a second order reaction, first order each in bromine and anisole. The rate of bromination is increased by the addition of zinc chloride, sodium chloride and iodine bromide, the catalytic activity of these being in the order: $IBr > ZnCl_2 > NaCl$. It has been found that the addition of zinc bromide, zinc acetate and sodium acetate does not affect the rate of bromination of anisole. Potassium bromide, however, decreases the bromination rate, presumably owing to the formation of tribromide ions.

With a view to elucidating the mechanism of the bromination of anisole in the presence of the added salts, kinetic isotope effects have been measured using anisole and anisole in which hydrogen at 2, 4 and 6 positions is replaced by deuterium. The ratio of the rates of bromination of the protium and the deuterium samples have been compared by calculating the factor, k_H/k_D from the second order rate constants. In the uncatalysed reaction as well as in the reactions in the presence of IBr, $ZnCl_2$ and NaCl, the k_H/k_D value is nearly unity, indicating that the loss of proton from the intermediate sigma-complex is a fast reaction. In the presence of potassium bromide, however, the k_H/k_D value is 1.2 at low bromide ion concentration (0.001 to 0.006 *M*) and 1.5 at higher bromide ion concentration (0.025 to to 0.222 *M*). This dependence of the kinetic isotope effect on the bromide ion concentration suggests a two-step mechanism for the bromination of anisole in the presence of an excess of bromide ion: the first step involves the rapid formation of an intermediate sigma-complex and the second step, the loss of a proton from the sigma-complex in a slow and rate determining process.

Further work on the interpretation of the kinetic data in terms of the equilibria involved in the reaction mechanism, spectrophotometric identification of the reaction intermediates and the isolation of the product is under way.

Morphology and Histology of Brain of a Cyprinoid Fish

Investigations on the morphology and histology of the brain of *Barilius bendelisis* in relation to the feeding habits are in progress in the Department of Zoology, D. A. V. College, Dehra Dun. *B. bendelisis* is a local food fish of considerable pisciculture value. The studies are being carried out by the research fellow, Mrs Kumud Sinha under the direction of Dr M. B. Lal of the Department.

B. bendelisis, a medium sized Cyprinoid fish, is found in abundance in the Doon Valley rivers. The brain is small in proportion to the size of the fish, and remains enclosed in the cranial cavity. It can be demarcated into fore, mid and hind brain. The forebrain consists of telenephalon and diencephalon. Telencephalon comprises a pair of olfactory sacs, olfactory bulbs, olfactory tracts and cerebral hemispheres. The whole structure is covered by a thin membrane which is the stretched roof of the telencephalon. The diencephalon region on the dorsal side consists of a small pineal body which remains within the brain membrane; ventrally it comprises hypophysis or pituitary body which is a small flattened structure carried on a small fibrous stalk.

The midbrain or mesencephalon consists of two well developed optic lobes. The optic ventricle is invaded by *valvula cerebelli*, a unique teleostean feature, which is an anterior in-pushing of cerebellum under the roof of the midbrain.

The hindbrain comprises a well-developed cerebellum and medulla oblongata. In *B. bendelisis* the facial lobe is a small structure situated in a median pit like depression on the dorsal side of the medulla oblongata. The small vagal lobes are situated on the lateral sides of the facial lobe.

The facial lobe and vagal lobes are peculiarly developed in Cyprinoid fishes in relation to the feeding habits. The well-developed cerebellum is correlated with the constant problem of equilibrium in water. *B. bendelisis* falls in the group of sight feeders as it possesses well-developed optic lobes. Also, the absence of olfactory lobes and the poorly developed facial and vagal lobes and short barbels point to the fact that it is not a taste feeder. It is a surface and mid-water dweller as it relies on visual perception for searching its food consisting of insects, algae, etc. available on the water surface. The well-developed cerebellum is correlated with the constant problem of equilibrium in the water.

Studies on Fungi Causing Post-harvest Diseases of Fruit and Vegetables

The scheme has been in progress under the guidance of Dr R. N. Tandon in the Department of Botany, Allahabad University, Allahabad since November 1968.

Fruit and vegetables suffer severe losses during the post-harvest stages as many fungi cause rot or deterioration. In many cases the organisms which become associated with the fruit and vegetables during their growing season remain dormant and cause severe damage during storage. Some orchards, kitchen gardens and vegetable markets were therefore surveyed at regular intervals for isolating associated fungi. Single spore cultures of different organisms were prepared and attempts were made to check the pathogenicity of the isolates. Subsequent studies were carried out with pathogenic forms only.

Nutritional studies of the different isolates were also undertaken as they could aid in finding out suitable methods for the control of loss. Fungal attack often causes deterioration in the nutritional qualities of the fruits. Attempts were made to determine chromatographically the changes in carbohydrates, free amino acids and various vitamins induced by different fungi.

Certain diseases are common to leaves and fruits of the host plants. The leaves used for packing the fruits may carry over the disease and cause the rot during storage. In such cases isolations from leaves were also made and detailed investigations of such fungi were undertaken.

The following fungi have been isolated from different fruit and vegetables: (1) Guava—*Gloeosporium psidii* Delacer., *Botryodiplodia theobromae* Pat., *Pestalotia psidii* Pat., *Phomopsis psidii* Camara, *Phoma psidii* P. Henn and *Rhizopus nigricans* Ebr.; (2) *Averrhoa carambola* Linn.—*Colletotrichum gloeosporioides* Penzig.; (3) *Spondias mangifera* Willd—*Aspergillus niger* Van Tiegham; and (4) *Pisum sativum* Linn.—*Cladosporium sphaerospermum* Penzig. The pathogenicity of the fungi has been established.

The influence of temperature on *Botryodiplodia* rot of citrus and sapodilla has been studied. The percentage rot at different temperatures has been calculated and it has been established that the losses could be checked or greatly reduced by storing fruit at 10°C. The changes in the free amino acid contents of tomato fruits under pathogenesis have been recorded.

The total absence or reduction in the amount of amino acids in the infected fruit may be attributed to their utilization by the fungus or to their degradation by enzymes, while the increase may be due to the proteolysis of the host protein catalysed by the normal host or fungal enzymes.

Changes in the ascorbic acid content of *mosambi* fruit induced by *Botryodiplodia theobromae* were determined. The results indicate that the ascorbic acid content of both the diseased and healthy fruits decreased as the time of incubation increased. The decrease was, however, less in healthy than in diseased fruits. No ascorbic acid was left in diseased fruit after 12 days.

VISITORS

Dr Mrs L. A. Kuprianova, Scientist, Komarov Botanical Institute, Leningrad, USSR visited the National Botanic Gardens, Lucknow during 16-27 Oct. 1969 under the Indo-Soviet Cultural Exchange Programme.

A five-man Hungarian technical team, which came to Mysore at the invitation of the Mysore Government to study the possibilities of developing agro-industries such as food processing, canning, starch and yeast manufacturing and manufacture of agricultural implements in the state visited the Central Food Technological Research Institute, Mysore on 28 Oct. 1969.

DEPUTATIONS

Dr M. S. R. Chari, Scientist, National Physical Laboratory (NPL), New Delhi attended the Ninth Thermal Conductivity Conference held at the Iowa State University, Iowa (USA) during 6-8 October 1969. Dr Chari contributed three papers based on the work being done in the Basic Physics Division, NPL. He also spent two weeks in the Solid State Physics Division of the university as a guest scientist. On his way back he spent a week in the Physics Department of the University of Pennsylvania, Philadelphia, USA.

DOCTORATES

Shri I. S. Kalra, CDRI, Lucknow—Ph.D. (Madras University); thesis: Metabolic studies on amoebae with reference to *Entamoeba histolytica* (Guide: Dr B. N. Singh).

PATENTS

FILED

122347: Improvements in or relating to the heart beat rate measuring instrument, R. Parameswaraiah & P. E. Sankaranarayanan—NAL, Bangalore.

122504: A new formulation for mosquito coils, S. Prashad & (Miss) R. Jamwal—RRL, Jammu.

122568: Automatic single double triple distillation apparatus, F. Kiss—NPL, New Delhi.

122586: Improvements in or relating to stencilling device for the electrochemical marking on metals, S. Guruswamy—CECRI, Karaikudi.

122692: A new unit for cracking silicon tetraiodide, F. Kiss, V. K. Amar & P. K. Gupta—NPL, New Delhi.

122718: Automatic lubricator for winding wire rope in service, A. K. Datta, M. N. Tarafdar & P. R. Roy—CMRS, Dhanbad.

122862: A device to study Bragg diffraction, V. N. Bindal—NPL, New Delhi.

122995: Processes for the utilization of waste chrome tanned leather shavings and trimmings for the manufacture of leather boards to be used as insole, stiffener, etc. in the footwear industry, K. Radhakrishnan—CLRI, Madras.

122996: Improvements in or relating to self-excited linear variable transformer as displacement sensing device and its instrumentation, R. Parameswaraiah—NAL, Bangalore.

122997: An apparatus for recording wind direction, V. R. Bhave—CPHERI, Nagpur.

SEALED

103201: A method for the production of lead zirconate titanate, T. V. Ramamurti, C. V. Ganapathy, T. R. Menon & N. Narayanswamy—NPL, New Delhi.

103216: Improvements in or relating to Leclanche type dry cells, M. G. Potdar, H. V. Udupa & K. S. G. Doss—CECRI, Karaikudi.

104522: Improvements in or relating to the inhibition of self-corrosion of aluminium as a galvanic anode in alkaline media, N. Subramanyan & V. S. Kapali—CECRI, Karaikudi.

104526: Remote indicating convergence indicator, R. N. Gupta & B. Singh—CMRS, Dhanbad.

104527: Remote indicating hydraulic load cell, R. N. Gupta & B. Singh—CMRS, Dhanbad.

105059: A wick sleeve to improve the non-smoking illumination when burning oil in a cylindrical wick lamp, K. S. Kambo & A. V. Venkatesh—IIP, Dehra Dun.

105060: A photoelectric instrument for the measurement of whiteness of materials, V. H. Vaidya & R. K. Sapre—CSMCRI, Bhavnagar.

105732: Improvements in the process for the preparation of desiccant from gypsum, M. A. Hai, E. R. Saxena & G. S. Sidhu—RRL, Hyderabad.

105733: A separator for immiscible liquids, K. S. Chari & N. M. Singh—CSIR, New Delhi.

105894: A process for improvement of strength of asbestos cement products from asbestos fibres and normal portland cement, A. K. Chatterji, R. S. Rawat & K. D. Dhariyal—CBRI, Roorkee.

105895: A pneumatic process for the conversion of phosphoric pig-irons to steels, B. R. Nijhawan, A. B. Chaterjee & J. Mohan—NML, Jamshedpur.

106114: Improvements in or relating to rust and scale removing jelly, K. S. Rajagopalan & C. Rajagopal—CECRI, Karaikudi.

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SCIENCE FOR CITIZENS

A Symposium

A four-day symposium on 'Science for Citizens' was organized jointly by the Council of Scientific & Industrial Research and the All India Newspapers Editors' Conference (AINEC) in New Delhi during 27-30 Nov. 1969 under the auspices of the Science Reporter Forum. A pioneering attempt to find ways and means of bringing the development and advance in science and technology to the informed layman, the symposium provided an excellent opportunity for prominent men concerned with mass communication media, viz. newspapers, radio, television and films, and eminent scientists representing different specializations to project their viewpoints and put forth their suggestions on various aspects of the problem. The discussions during the symposium enabled a clearer appreciation of the roles of mass media and the scientists in generating science consciousness in the public.

The symposium was attended by representatives from the national laboratories and institutes and invitees including mass media specialists and eminent men of science.

Prof. V. K. R. V. Rao, Minister of Education & Youth Services, and Vice-President, CSIR set the tone for discussions during the symposium. In his inaugural address, he observed "Science and technology affect the largest and the mightiest governments as much as the humblest individual. As there is no escape from the impact of science and technology, the only way to make this age of common man meaningful is to bring science and the common man closer together. When the lay citizens are exposed to science and technology, and when science and technology begin to receive the attention of the common man, there begins to develop as a whole an individual and collective attitude that encourages national thinking, tolerates criticisms and values even the negative results. It is this kind of scientific climate that is lacking in the developing countries. The omission can be rectified only if we make every effort to see that science and technology pervade the society and are appreciated by it for their utility". Calling upon the daily newspapers, All India Radio, the TV Centre, and the Films Division to give wider coverage to science and technology, Prof. Rao identified the following typical areas for intensive coverage: (i) space exploration; (ii) developments

SCIENCE REPORTER FORUM
CSIR - AINEC
SYMPOSIUM
SCIENCE FOR CITIZENS
NOV 27 - NOV 30. 1969

Dr Atma Ram, Director General, Scientific and Industrial Research, explaining the scope of the symposium on the opening day—27 Nov. 1969. From left: Shri D.R. Mankekar, Prof. V.K.R.V. Rao, Shri B.G. Verghese and Shri S.P. Ambasta in respect of 'substitute materials' and 'substitute methods'; and (iii) utilization of waste materials and byproducts. Prof. Rao suggested the setting up of a 'Science Popularization Centre' linked to the CSIR, and the organization of a 'Science Brains Trust'.

The following papers were presented and discussed: "Bridging the two cultures"— Shri D.R. Mankekar; "Some aspects of astronomy"—Dr Jagjit Singh; "Reporting of science in Indian newspapers"—Shri Kuldip Nayar; "All India Institute of Medical Sciences, relevant or redundant?"—Dr V. Ramalingaswami; "Mathematical logic as a guide to physical thought"—Dr A. Ramakrishnan; "Science through radio and television"—Shri Romesh Chander; "Protein problem in India"—Dr C. Gopalan; "Science and self-reliance"—Shri Frank Moraes; "Matter, life and mind"—Dr G. N. Ramachandran; "Science and social attitudes"—Shri Vishwanathan; "Science and the masses" —Shri B. G. Verghese; "Science through films"—Shri K. L. Khandpur; "Science and the people"—Shri Kamalesh Ray; "Recent developments in archaeology"—Dr B.B. Lal; "Science and the daily newspapers" —Shri S. K. Basu; "Scientific research and the common man"—Dr Atma Ram; "Impact of technology on education"—Dr A. N. Pandeya; "Prospects of meteorological science"—Dr P. Koteshwaran and "The dilemma of a science magazine" —Shri S. K. Jha.

Speaking on "Reporting of science in Indian newspapers", Shri Kuldip Nayar, editor of *The Statesman* lamented the 'lack of interest in science news' on the part of the Indian Press. He lay blame equally on scientists' shoulders for having no time to spare to educate masses, and if at all they did so their language was beyond the comprehension of the common man. He further said that even today most of the scientific knowledge is within the confines of laboratories. If such knowledge is allowed to reach the concerned fields, its impact would be perceptible soon. Talking of science popularization through popular science magazines, he said that there is a growing taste now for scientific material.

Dr V. Ramalingaswami, Director, All India Institute of Medical Sciences, New Delhi said that science journalism in India was 'in the gestation period'. He was not in favour of some institutions backed by resources to become 'islands of excellence' as this would lead to a 'scientific aristocracy' which would not be of much use. Resources alone did not lead to good research. It was the method of approach and the level of excellence which could be brought about by liberating creative forces in institutions.

Shri Romesh Chander, Director of the TV Centre, deplored that All India Radio did not have a science editor or producer. The telecast and broadcast science programme ought not follow 'a text-book pattern', which the viewers and listeners found uninteresting. Suggesting potential topics for intelligent telecasting he listed electrocution, malnutrition, liquor poisoning and the like. He appealed to scientists and science writers to use regional languages to reach the layman.

Presenting his paper, "Science and self-reliance" Shri Frank Moraes, editor-in-chief, *The Indian Express* declared : "In India the dead hand of bureaucracy weighs heavily on almost all forms of public activity and enterprise". He suggested : "Science and technology are best left to scientists and technologists, and not committed to the tender mercies of bureaucrats. I would go further. The trend in many European countries, notably France, is to replace the bureaucrat by the technocrat in those echelons of administration where the latter is more useful than the former".

Shri B. G. Verghese, editor-in-chief, *The Hindustan Times* saw the need to reorient the thinking of layman and the scientist alike to keep pace with the advance in the scientific and technological fields.

"It would be desirable to set up a centre for the production, procurement and utilization of scientific films in India", was the suggestion made by Shri K. L. Khandpur, Controller, Films Division, Government of India. Recalling the paramount need of the day to recognize the importance of the role which the films and television can play in dissemination of scientific information he emphasized that the proposed centre in collaboration with International Scientific Films Association and International Scientific Films Library, would build up a good documentation and bibliographic service pertaining to films.

"Scientific illiteracy has to be fought with the same seriousness as the general illiteracy", observed Shri Kamalesh Ray, CSIR. Outlining the steps for advancing the cause of science popularization he stressed the importance of creation of science desks in mass media establishments with one or two competent hands. It would greatly help in selecting and editing the incoming contributions and reporting upon scientific conferences.

The speakers in the concluding session were Dr B. B. Lal, Shri S. K. Basu, Dr A. N. Pandeya, Dr P. Koteshwaran and Shri S. K. Jha.

Representatives of mass communication media attributed the failure of the Press to generate science consciousness in the lay public to indifferent coverage of news about scientific and technological developments. Both the journalists and scientists have an obligation to the society. They have to keep the public informed of the major developments in science and technology and bring home their social implications. Greater attention should be paid to keep the public informed of the more fruitful and constructive aspects of scientific research and innovation in and outside the country. Leaders of the Press and the scientists were, therefore, called upon to give a big push to science journalism which has not made much headway as yet in the country. One of the ways suggested by Shri D. R. Mankekar, President of AINEC, was the institution, on the lines of the American Pulitzer Prize, of an annual prize of substantial value for achievements in the fields of science journalism. Notable among the other suggestions put forward were: (i) the need for issuing good popular science journals in the regional languages, and (ii) establishment of a centre for the production, procurement and utilization of scientific films.

Addresses delivered by various scientist participants were illustrative of the manner in which topics of current interest in various disciplines could be presented for easy comprehension by the lay public.

In his address entitled "Scientific research for the common man", Dr Atma Ram, Director General, Scientific & Industrial Research drew attention to the problems peculiar to India in the application of science and technology to the process of economic growth. He stressed that the primary function of scientists and technologists in the country should be to solve the pressing economic problems of the country, viz. how to put to maximum advantage the limited resources of the country in the shortest possible time, so that every man in the country gets his essential needs like food, clothing, shelter and other necessities. Dr Atma Ram lucidly explained the much-debated point concerning the assessment of scientists' contribution to the country's material advancement. In his opinion: "A research laboratory contributes to social and economic development in both visible and invisible ways. To cite an example: CSIR has compiled and published several volumes of a publication called *The Wealth of India*. In them you find information about our natural resources. These volumes have provided the government, planners and policy makers, manufacturers and industrialists important information which together has added to India's social and economic development. How can one measure the outcome of this work in terms of money?".

The symposium succeeded in focussing the attention of those concerned with mass communication media, scientists and administrators to the importance of creating and forging links for the smooth permeation of scientific knowledge to the masses. The participation of leading men associated with mass communication media and scientists and technologists in a symposium of topical interest augurs well. Necessary follow-up action on the various recommendations of the symposium will achieve the objective of bringing science to the layman.

Recovery of Molybdenum, Copper & Nickel Minerals from Uranium Ore

Pilot plant tests have been carried out at the National Metallurgical Laboratory (NML), Jamshedpur with run-of-mine ore sample from Jaduguda Mines sent by Uranium Corporation of India Ltd with a view to recovering copper, nickel and molybdenum minerals from the uranium bearing ore prior to uranium extraction. The objective is to set up a mineral byproduct recovery plant for treating 1000 tonnes of run-of-mine uranium ore per day at Jaduguda.

The sample analysed to : Cu, 0.17%; Ni, 0·02%; and Mo, 68·30%. Straight flotation of molybdenum from the test sample ground to about 65% —200 mesh, using fuel oil and cresylic acid followed by subsequent flotation of copper-nickel minerals by xanthate from the rougher molybdenum tails yielded : (i) a rougher molybdenum concentrate assaying Cu, 5·99%, Ni, 3·3% and Mo, 1·49% with recoveries of Cu, 31·2%, Ni, 14·2% and Mo, 51·8%; and (ii) a rougher Cu-Ni concentrate assaying Cu, 1·16%, Ni, 1·57% and Mo, 0·12% with recovery of Cu, 28·3%, Ni, 31·6% and Mo, 19·5%.

The molybdenum recovery in the rougher molybdenum circuit could be improved substantially by using sodium cyanide in combination with fuel oil and cresylic acid. The rougher molybdenum concentrate thus produced assayed Mo, 1·35%, Cu, 6·6% and Ni, 2·5% with a recovery of about 73% Mo. The grade of the rougher molybdenum concentrate could be improved by repeated cleaning to produce a concentrate assaying Mo, 31·54%, Cu, 1·1% and Ni, 0·35% with a molybdenum recovery of 45.1%. According to the Bhabha Atomic Research Centre, the product assayed Mo, 44·75%. On this basis molybdenum recovery in the product would improve to about 64%.

From the rougher molybdenum tails the Cu-Ni minerals were recovered by xanthate flotation. The rougher Cu-Ni concentrate and first cleaner molybdenum tails were mixed. The mixed concentrate thus obtained contained Cu, 3·25%, Ni, 2·67% and Mo, 0·22% with recoveries of Cu, 45·9%, Ni, 30·5% and Mo, 20·4%.

Beneficiation Studies on Low-grade Phosphate

Batch and pilot plant beneficiation studies to develop a process flow-sheet as well as to produce phosphate concentrate for the manufacture of superphosphate from low-grade phosphate rock sample (from Maton Block, Udaipur dist, Rajasthan) sent by Hindustan Zinc Ltd, Udaipur have been carried out by the National Metallurgical Laboratory, Jamshedpur. The sample contained 28·06% P_2O_5.

Batch tests with sample ground to 91%—200 mesh using oleic acid emulsion and sodium silicate followed by two cleanings of the rougher concentrate yielded an apatite concentrate assaying P_2O_5 35·1% with a recovery of 77·9% P_2O_5. Retreatment of the bulk concentrate using sodium silicate and *katha* produced a final apatite produce assaying 38·5% P_2O_5 with a recovery of 72·1% P_2O_5.

Based on the batch tests, a flowsheet was developed for the pilot plant operation. It consisted of two stages. The first stage was to produce a bulk phosphate-calcite concentrate assaying P_2O_5 33-34% with a recovery of 88-90% P_2O_5. The second stage was to retreat this bulk concentrate with *katha* for depressing apatite minerals in the tails and to discard a calcite-rich float. This final treatment produced a phosphate refloat concentrate assaying P_2O_5 36·3% with a recovery of 75·0% P_2O_5.

CBRI Annual Report: 1968

The annual report of the Central Building Research Institute (CBRI), Roorkee shows that the institute has made substantial progress during the year under review. In the field of building materials the institute designed and constituted a 2.5 tonne capacity kiln for partial calcination of dolomite for the production of magnesium oxychloride cement. Dolomite based oxychloride cements are about 30% cheaper than magnesite based cements. The institute has developed technical know-how for producing cellular concrete from lime and flyash and has carried out full factory scale trials with satisfactory results. The pilot lime kiln designed and developed by CBRI for improved burning of limestone was found to be thermally more efficient than conventional kilns.

In the field of soil engineering the institute has developed a procedure for increasing the bearing capacity of bored cast-in-situ short piles in soft soils. It consists in driving a mandrel into the green concrete of a cast-in-situ pile and gradually pulling it out. At the instance of the Gujarat Electricity Board, the institute prepared economic designs for transmission line tower foundations for the Little Rann of Kutch and some river crossings.

Thermal data at low temperatures were determined for various commercially available insulation materials. The data are of great value in the design of cold storages and allied structures. A prototype medium size solar water heater has been designed and fabricated. The heater can heat 500 litres of water up to 60°C in the afternoons during winter.

A light duty manual hoist has been designed and developed. It has a lifting capacity of 300 kg up to 20 m height; is capable of easy mounting on a scaffolding or structure and has the freedom of swivelling all round. A brick making machine giving an output of 3000 bricks/hr has been designed, fabricated and commissioned. Extensive trials have shown that its efficiency is satisfactory.

A planning system based on collinear arrangement of square units has been evolved for the planning of system built housing for the low and middle income groups. Prototype plans for seven types of dwellings ranging from 28 to 70 m^2 in area with 7 m^2 increments were prepared to suit different dwelling configurations and groupings. Type designs of single teacher primary school buildings for Uttar Pradesh have been developed in collaboration with the U.P. State Education Department.

The institute released the following two processes to industry for commercial utilization: (i) manufacture of oxychloride cement composition and flooring tiles and (ii) heat flow transducer. Three processes were ready for release; these included (i) brick making machine, (ii) preparation of partially calcined dolomite for use in magnesium oxychloride cement compositions; and (iii) ultrasonic equipment for testing cement and concrete. Four patent applications were filed in regard to the following: scaffold hoist (working on power), scaffold hoist (manual), dual flushing cistern and brick making machine.

CSIR SUPPORT TO RESEARCH

New Schemes

Geology and Mineral Resources of Kutch

This new research scheme started in June 1969 under the purview of the Geological & Mineralogical Research Committee. The principal investigator is Shri M. C. Poddar, Oil & Natural Gas Commission, Dehra Dun. The first part of the work envisages a detailed geological study of the area.

Kutch forms an important sedimentary basin in northwest India. The stratigraphy of Kutch is very significant in the geological history of India owing to the variety of rock formations met with under different environments ranging from Jurassic to Recent times. The marine Mesozoic rocks containing a large variety of ammonites have been of great value and received much attention from many well-known geologists, thus making the area a very representative one for palaeontological study.

Blanford, Waagon and Fox of the Geological Survey of India believe that the great Mediterranean sea extended beyond the main Himalayan geosyncline in Jurassic times through the Salt Range and Baluchistan to south into parts of Rajasthan and Kutch. Due to considerable down warping of the coastal tracts initiated during the Jurassic period, the sea level oscillated many times changing the depositional environment. The Kutch basin is characterized by a distinctive tectonic style. A prominent structural feature of the basin is deep upthrust faulting along east-west trend. The original, mostly horizontal, Mesozoic formation have changed in attitude by bodily tilting by the underlying injected basis rocks which have been observed in some localities due to the erosion of the overlying sediments. These basic rocks have exerted a dominant influence on the structural evolution of the entire Mesozoics along the major anticlinal axes. Towards the end of the Mesozoic, the outpouring of the lava flows in the southern and western parts of Kutch is also a major event in the geological history of the area. These lavas appear to have been erupted during upper Cretaceous to Paleocene although some of the intrusives appear even younger.

The Tertiary belt ranging from Eocene to Poleistocene represents almost a complete cycle of sedimentation over the eroded trappean rocks and is a homoclinal area of undulatory strata. Some of the structural nosings observed in the sediments are formed by the draping of sediments over buried features.

The marine Tertiary did not receive as much attention as the Mesozoic. Recent studies on these rock formations by the Geological Survey of India and the Oil & Natural Gas Commission have made important contributions to present knowledge.

The second part of the work will be on the mineral resources of the area. An effort is being made to convey the importance of these mineral deposits in the economy of Kutch. The economic aspects of the mineral occurrences particularly salt, lignite, bauxite, limestone and clays, in addition to other minerals including oil will be assessed with particular reference to their potentialities as raw materials for industry.

Completed Schemes

Metabolism of Aminosugars in Mammalian and Microbial System

This CSIR-sponsored scheme, functioning under the purview of the Chemical Research Committee concluded in Dec. 1968 after a three-year tenure at the Bose Institute, Calcutta. Dr Sudhamoy Ghose, Reader in Biochemistry at the Institute was the investigator-in-charge.

Studies on aminosugar metabolism in mammalian and microbial systems were undertaken with a view to understanding how structural macromolecules such as cell-wall mucopeptide or connective tissue ground substances (i.e. hyaluronic acid, chondroitin sulphates, etc.) are synthesized, and what are the regulatory mechanisms for the formation of these substances in growing tissues or cells. Because of the difficulties in procuring rare biochemicals, attention was devoted mainly to the control mechanism operating in the pathways of aminosugar metabolism rather than the biosynthesis of structural macromolecules. Several strategic enzymes with regulatory function have been identified and their allosteric effect on the metabolic pathways of UDP-N-AcGm and CMP-sialic acid biosynthesis has been studied.

Hog Spleen N-AcGm Kinase

A highly specific kinase which phosphorylates N-acetylglucosamine (N-AcGm) has been purified approximately3500-fold from the extracts of hog spleen. An $S_{20,w}$ of 5·5 is obtained for the native enzyme. Kinetic and other properties of the enzyme have been studied in some detail.

The enzyme is inhibited by the reaction products, ADP and AcGm-6-P. The inhibition by ADP is competitive against ATP, whereas the inhibition by N-AcGm-6-P is of non-competitive type. UDP-N-AcGm, the end product of the pathway of N-AcGm metabolism, is found to be a strong non-competitive inhibitor of the kinase reaction.

Hill plot of N-AcGm saturation kinetics of the enzyme in the presence of its non-competitive inhibitors (UDP-N-AcGm or N-AcGm-6-P) showing $n=2$ ($n=$Hill coefficient) suggests that there may be more than one site for binding the substrate on the enzyme molecule. The enzyme protein could be desensitized to UDP-N-AcGm and N-AcGm-6-P by controlled heat treatment without much loss of its catalytic activity. All these results strongly suggest that the hog spleen N-AcGm kinase is a regulatory enzyme, and that both the end-product UDP-N-AcGm and the reaction product N-AcGm-6-P act on the enzyme as feed-back inhibitor.

Properties of N-AcGm-2-Epimerase

Ghosh and Roseman reported in 1965 that N-AcGm-2-epimerase isolated from hog kidney showed an absolute requirement for a catalytic quantity of ATP. But the role of ATP was not understood at that time. It has now been observed that ATP is not absolutely essential for the activity of 2-epimerase, but it exerts a stimulatory effect on the enzyme causing approximately a 20-fold increase of its activity. 2-Epimerase has been purified about 1500-fold from the crude extracts of hog kidney.

Km value for N-AcGm determined in the absence of ATP was $9\times10^{-3}M$; whereas the same, in the presence of saturating concentration of ATP, was $1{\cdot}7\times10^{-3}M$. Optimum *p*H for ATP-dependent and ATP-independent activity was approximately 7·6 in both the cases.

The ATP saturation curve of the 2-epimerase did not conform to Michaelis-Menten kinetics. The curve obtained was sigmoidal in shape indicating cooperative binding of ATP molecules. Hill plot yielded an interaction coefficient of $n=2{\cdot}6$.

Other kinetic evidences indicate the presence of homotropic interactions between substrate molecules.

The allosteric effect of ATP is now further confirmed by the specific disruption of the ATP binding without affecting the ATP-independent catalytic activity of the enzyme. The desensitization of 2-epimerase to ATP could be brought about in two ways, controlled heat treatment and PCMB treatment. The selective destruction of ATP effect (on 2-epimerase) strongly suggests that the site for binding the activator (i.e. ATP) is largely independent of the site for binding the substrates.

All these results clearly demonstrate that the specific stimulatory action of ATP on the enzymatic epimerization is due to an allosteric effect.

Research Papers

(1) Allosteric effect of ATP on N-acetylglucosamine 2-epimerase, Datta, A. and Ghosh, S. *Indian J. Biochem.*, **4** (1967), 197.

(2) Role of allosteric enzymes in the regulation of N-acetylglucosamine metabolism, Datta, A. and Ghosh, S., *Trans. Bose Res. Inst.*, **30** (1967), 167.

Metabolism of Aminosugars in Yeast

In connection with the investigation on aminosugar metabolism in *Candida albicans*, the following observations have been made.

When tested as a carbon source, N-acetylglucosamine (N-AcGm) was found to be utilized by *C. albicans* for growth at a rate somewhat slower than that of glucose but much higher than that of glutamic acid. However, N-AcGm supported growth of *C. albicans* almost as well as glucose. A mutual competition was observed between N-AcGm and glucose with respect to their uptake for growth when they were present simultaneously in the medium. Glutamic acid, on the other hand, could not inhibit the uptake of N-AcGm.

N-AcGm kinase, that catalyses the first step in the pathway of N-AcGm metabolism, has been found to be present in *C. albicans* grown, either with N-AcGm or with glucose but incubated several hours with N=AcGm. Several kinetic experiments on the formation of N-AcGm kinase in *C. albicans* suggested that this is an inducible enzyme. The induction of the kinase in *C. albicans* could be stopped by the addition of cycloheximide, a known antifungal antibiotic that specifically stops protein synthesis in the organism. The enzyme has been isolated from N-AcGm grown *C. albicans* cells and purified 15-fold. The reaction catalysed by partially purified enzyme has been characterized by identification of the reaction products and by stoichiometry. A search for other enzymes involved in aminosugar metabolism revealed that N-AcGm-6-P deacetylase and glucosamine-6-P deaminase are also induced by N-AcGm in *C. albicans*. The deaminase was found to be susceptible to inhibition by UDP-N=AcGm.

Membrane-bound PEP:Hexose Phosphotransferase system of *Esch. coli*

It has been possible to demonstrate that the PEP: hexose phosphotransferase system (PHPS) *E. coli* consisting of two enzymes (Enzyme

I and Enzyme II) and a phosphate carrier protein (HisPr) exist actually in a particulate form bound to cell membrane in their native state. When *E. coli* cells are disintegrated with glass beads and soluble proteins are repeatedly extracted with phosphate buffer, an insoluble fraction called 'cell debris' is obtained after centrifugation at low speed, and a supernatant fraction that contains about all soluble enzymes. The insoluble 'cell debris' is found to possess almost all (more than 95% of total) PHPS of *E. coli* and its specific activity using 2-deoxyglucose as substrate is found to be surprisingly high (100 mμmoles/min/mg protein) compared to the same of the crude sonic extracts of the bacteria (10 mμmoles/min/mg protein). The presence of PHPS in the insoluble cell debris that catalyses the formation of glucose-6-phosphate and N-acetylglucosamine-6-phosphate using exclusively PEP as phosphoryl donor suggests that the system plays a role in the function of the membrane (possibly transport). Dissolving cell wall material by lysozyme does not destroy the activity of the insoluble cell debris.

Another interesting observation was that frozen and thawed *E. coli* cells could also phosphorylate 2-deoxyglucose at a rather high rate in the presence of PEP. The accumulation of deoxyglucose-6-phosphate in the incubation medium was found proportional to time and absolutely dependent on the presence of PEP. The activity was not observed when ATP replaced PEP. In the absence of deoxyglucokinase (ATP: deoxyglucose-6-phosphotransferase) in *E. coli*, any formation of deoxyglucose-6-phosphate in the surrounding medium of frozen cells is a strong evidence for the presence of PEP: hexose phosphotransferase system at the cell surface. Uptake studies with 2-deoxyglucose in *E. coli* and the results of other experiments with aminosugars strongly suggest that this membrane bound phosphotransferase system mediates active transport of N-acetylglucosamine and N-acetylannosamine in *E. coli*.

Research Papers

(1) Probable role of a membrane-bound PEP: hexose phosphotransferase system of *E. coli* in the permeation of sugars, S. Ghosh and D. Ghosh, *Indian J. Biochem.*, **5** (1968), 49.

Specific Glucokinase and N-AcGm Kinase of *Staphylococcus aureus*

Although N-AcGm kinase has been detected in bacteria and in animal tissues, the enzyme has not yet been extensively purified nor its characterization done very convincingly. On the other hand, Zelesnick and his coworkers isolated and purified an enzyme 1500-fold from the extracts of *S. pyogenes* which catalysed the phosphorylation of glucose and N-AcGm at the same rate suggesting the same enzyme acting on both substrates. Investigations have been made with *S. aureus* to determine the specificity of these two kinases, viz. N-AcGm kinase and glucokinase, after their partial purification. The following results have been obtained.

(1) Crude extracts of *S. aureus* catalyse the phosphorylation of both N-AcGm and glucose in the presence of ATP and Mg^{++}, but the activities can be separated by protamine sulphate treatment of the crude extracts. (2) The fraction containing N-AcGm kinase activity has been purified 22-fold with 33% recovery and that containing glucokinase activity 44-fold with 30% recovery by employing the usual techniques of enzyme purification. (3) The partially purified N-AcGm kinase fraction shows high specificity for their substrates, namely, N-AcGm and ATP. Similarly, the glucokinase fraction has been found to be active only in the presence of glucose and ATP. (4) While glucokinase exhibits optimal activity at *p*H 7·6, the *p*H optima for N-AcGm kinase lie between 7·3 and 8·5. (5) Km values for the substrates N-AcGm and ATP in the case of N-AcGm kinase are $4{\cdot}0 \times 10^{-4}\ M$ and $1{\cdot}2 \times 10^{-3}\ M$, and $9{\cdot}5 \times 10^{-4}\ M$, and $1{\cdot}1 \times 10^{-3}\ M$ respectively. (6) The reactions catalysed by glucokinase and N-AcGm kinase have been well characterized by identifying the reaction products and by stoichiometry.

N-AcMn Kinase of *Salmonella typhimurium* and other Micro-organisms

N-Acetylaminosamine (N-AcMm) kinase, the enzyme catalysing the ATP-dependent phosphorylation of N-Ac-Mm has not yet been detected in bacteria. An investigation has, therefore, been carried out to demonstrate its presence in bacteria. The results obtained are briefly as follows. (1) N-AcMm is found to be formed in *S. typhimurium* when the cells are grown in the absence of glucose. (2) The enzyme has been isolated from the extracts of glycerol grown *S. typhimurium* and purified 258-fold with 17 % yield. (3) The enzyme is highly specific for its sugar and nucleotide substrate, phosphorylating only N-AcMm in the presence of ATP.(4) The purified enzyme loses about 33 % activity during storage at 5°C in 7 days and is stable to dialysis. (5) N-AcMm kinase exhibits optimal activity between *p*H 6·2 and 8·1. (6) Km values for N-AcMm and ATP are $7{\cdot}5 \times 10^{-4}\ M$ and $1{\cdot}15 \times 10^{-3}\ M$ respectively. (7) The enzyme has an absolute requirement for a divalent cation, Mg^{++} being the most effective. Mg^{++} may be replaced by Mn^{++} or Co^{++} with lesser degree of effectiveness. (8) The activity of the enzyme remains unaffected by the addition of glucose, N-AcGm or N-AcGm-6-P to the assay mixture. (9) PCMB inhibits the activity of the enzyme completely at a conc. of $2 \times 10^{-4}\ M$. The activity can be protected by the simultaneous addition of excess of 2-mercaptoethanol. (10) Stoichiometric analysis shows that the enzyme catalyses the reaction:

$$\text{N-AcMm} + \text{ATP} \xrightarrow{Mg^{++}} \text{N-Ac Mm-6-P} + \text{ADP}$$

(11) The products of the reaction catalysed by N-AcMm kinase have been characterized as N-AcMm-6-P and ADP. (12) The enzyme is not formed when *S. typhimurium* is grown with glucose as its carbon source. The level of the enzyme is not increased by incubation of the cells with N-AcMm. (13) The enzyme has been detected in both Gram-positive and Gram-negative bacteria only when the cells were grown in the absence of glucose.

Research Papers

(1) Studies on the specificity and properties of acetyl-aminodeoxyglucose kinase and glucokinase from *Staph. aureus*, S. Banerjee and S. Ghosh., *Indian J. Biochem.* **4** (1967), 199.

OCESSES READY FOR COMMERCIAL UTILIZATION

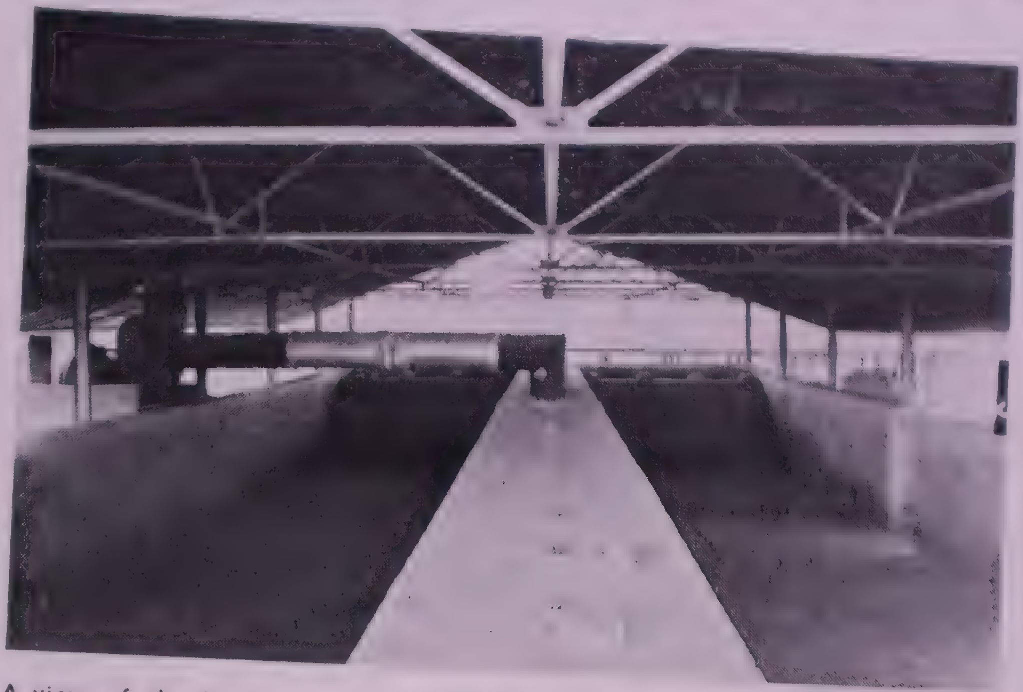
Kiln for Burning Building Bricks

The building brick industry in ndia is presently using the Bull's rench kiln. This kiln suffers from many drawbacks such as low thermal efficiency and poor quality of bricks burnt in it. Moreover this kiln works only during day season. The industry is, therefore, in dire need of a kiln which has high thermal efficiency, works in all seasons and is cheaper in construction and operation. The mechanized plants established in the country at present are imported and involve considerable foreign exchange. The Central Building Research Institute (CBRI), Roorkee has designed and constructed a high draught continuous kiln (burning capacity, 15 000 bricks/day) which fulfils most of the requirements of a modern brick-making plant. This kiln can be burnt throughout the year and is thermally as efficient as Hoffmann and similar kilns commonly used in advanced countries. The cost of construction of a kiln with a capacity for burning 15 000 bricks/day would be about Rs 55 000 as compared to Rs 2 lakhs for a Hoffmann kiln of equivalent capacity.

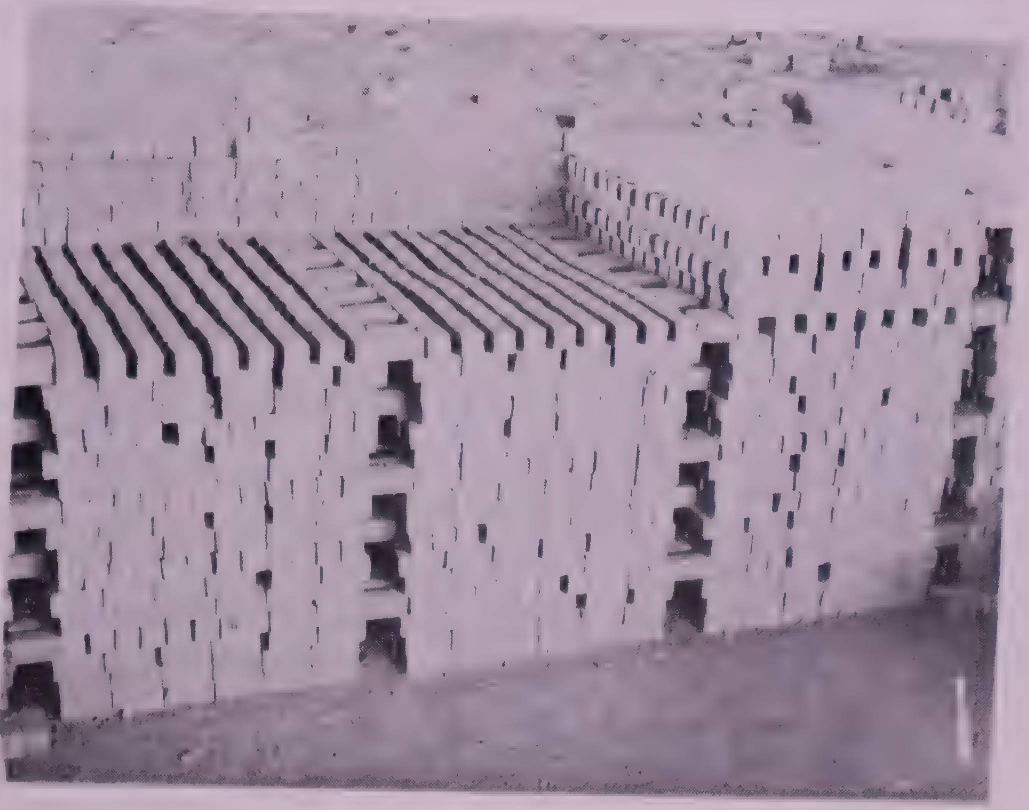
The kiln is an archless, top-fed, coal-fired continuous kiln in which he fire follows a zig-zag path. The etting area is divided into a number of chambers by partition walls. The partition walls are built with nfired bricks and are dismantl-d at the time of unloading the bricks rom a chamber. About 7500 bricks an be loaded in each chamber and a aily output of 15 000 bricks can be btained. Similar kilns of enlarged imensions can be designed for burn-g up to 30 000 bricks/day.

Draught is provided by a fan d the products of combustion are annelized through a system of es, the flow of gases being control-l by suitable dampers. In actual ing runs, the kiln has proved to highly efficient. Fuel consump-n has been found to be low—) kg/1000 bricks as compared to -200 kg/1000 bricks normally sumed in Bull's trench and Hoffmann kilns. The quality of bricks produced is also highly satisfactory; more than 80% of the bricks are of class I quality (IS Specification 1077:1966, first revision) and rejects amount to less than 5%.

Common building bricks of class I quality are used in all brickwork. No fire brick is required for any part of construction. The entire brickwork is constructed with mud mortar except the foundations in which lime concrete is used. The



A view of the high draught continuous brick kiln designed and constructed by CBRI, Roorkee



Pattern of stacking of bricks in the kiln shed over the kiln is supported on tubular trusses and corrugated iron sheets are used as cover. The trusses are supported on steel stanchions.

The economics of construction and operation of the CBRI kiln have been worked out. It has been found that a kiln with a burning capacity of 20 000 bricks/day (24 hr) would be the smallest economic unit. The estimated capital outlay on a kiln of this capacity would be about Rs 76 000 including the cost of construction of shed. The estimated cost of burning 1000 bricks based on the output of 7 million bricks/day comes to about Rs 9.

The present production of bricks (estimated at about 2000 crores/annum) lags far behind the present demand, which is expected to reach 3000 crores/annum in the next 5 years. This large expansion of the brick industry and the rising cost of bricks are a fair measure of the expected demand for the improved CBRI kiln which offers several advantages over the traditional Bull's trench kiln. The gradual introduction of mechanization in the brick industry is also likely to accelerate the adoption of the CBRI kiln by the brick industry.

Parties interested in the commercial exploitation of the design of the kiln may correspond with the Secretary, National Research Development Corporation of India, Lytton Road, New Delhi 1.

Corrosion in Chemical Industry : Seminar

This seminar is being organized by the Corrosion Advisory Bureau of the CSIR Metals Research Committee in collaboration with the Indian Chemical Manufacturers' Association (ICMA) in Bombay from 3 to 6 Feb. 1970. The seminar will discuss the corrosion problems pertaining to chemical industries and methods to mitigate losses due to corrosion. Intending participants may contact the Deputy Secretary, ICMA, Bombay or Officer-in-charge, Corrosion Advisory Bureau, c/o Metals Research Committee, Tata Iron & Steel Co. Ltd, Jamshedpur.

PATENTS

ACCEPTED

112488: Aluminium furnace brazing flux, C. P. Srivastava, B. R. Guha & B. B. Prasad—CMERI, Durgapur.

112574: A simple process for preheating the air blast in cupola, J. Mohan & A. B. Chatterjea—NML, Jamshedpur.

112576: An apparatus to heat-treat processed and sized fish and other protein-rich foods of similar species, G. S. Chowdhury, K. K. Saroj & V. S. Rao—RRL, Bhubaneswar.

112577: Improvements in or relating to impregnation of braided linen threads with conducting carbon, C. V. Suryanarayana, N. Rangarajan, K. N. Rao & M. J. Mangalam —CECRI, Karaikudi.

112615: Improvements in or relating to starting circuit for fluorescent lamps, G. Subramanian, S. Balachandran, K. Sundararajan, C.V. Suryanarayana & K. S. Gururaja Doss—CECRI, Karaikudi.

112777: Process for the recovery of potassium salts from molasses distillery spent wash liquor using ion-exchange technique. H. M. Bhavnagary, R. Ramaswamy & N. R. Krishnaswamy — CSMCRI, Bhavnagar.

112946: Process for the calcium fortification of crystalline common salt, G. C. Jain, J. M. Patel, R. M. Bhatt & R. B. Bhatt—CSMCRI, Bhavnagar.

113063: Improvements relating in or to resolution of sucker rod wax, A. K. Biswas, P. V. Krishna, Dipak Chanda & M. S. Iyengar—RRL, Jorhat.

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